THE JOURNAL OF GAS LIGHTING
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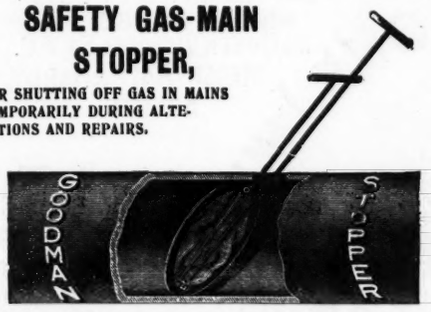

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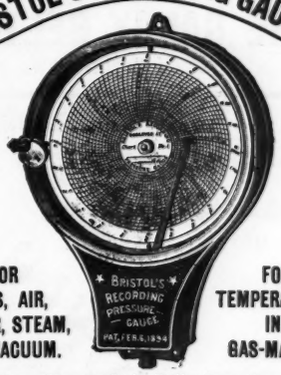

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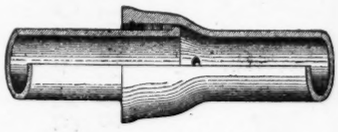

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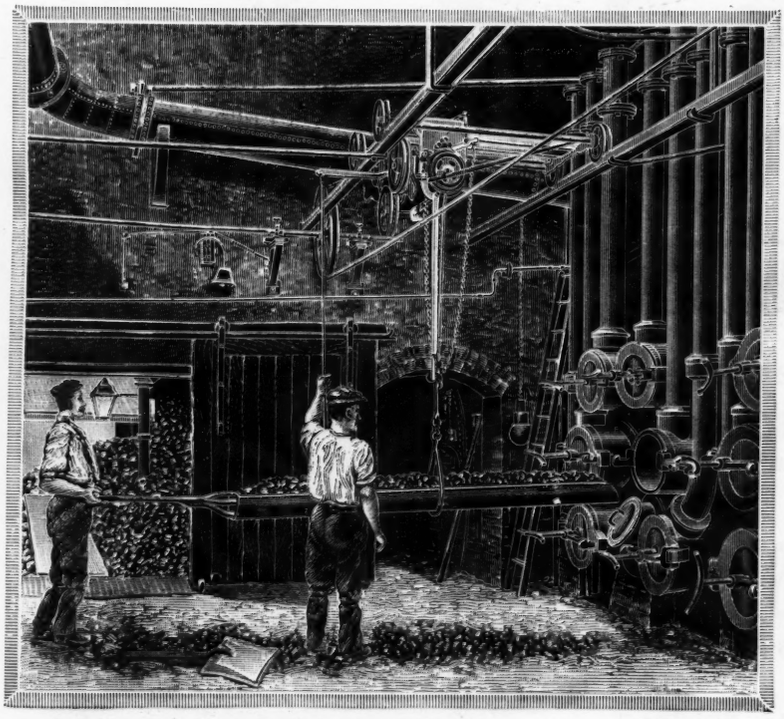

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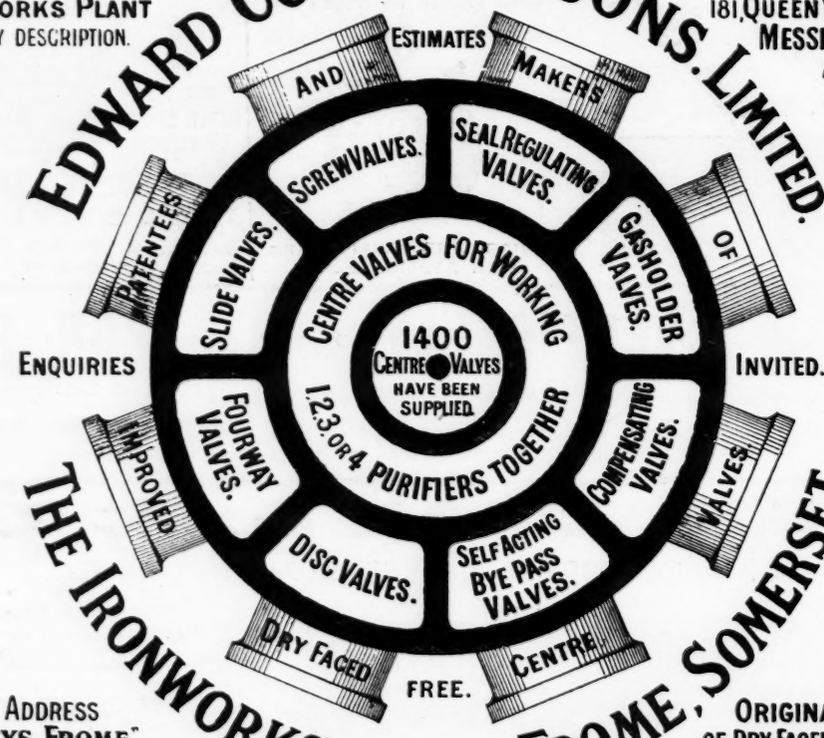

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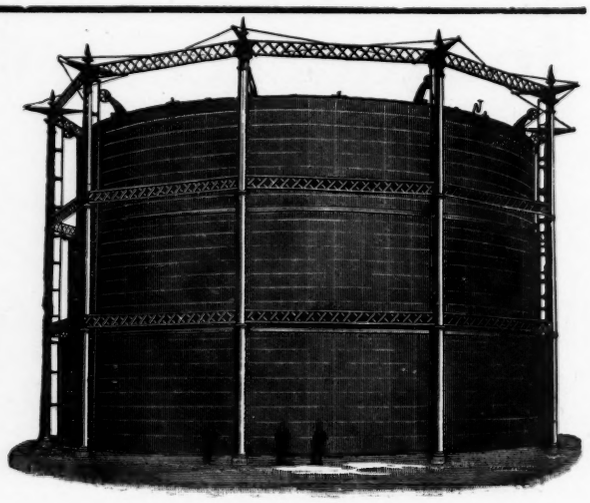

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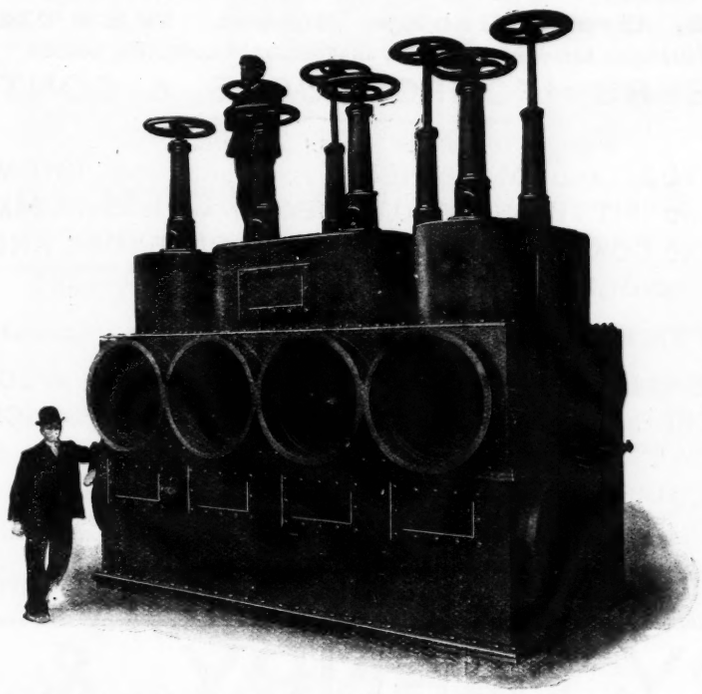

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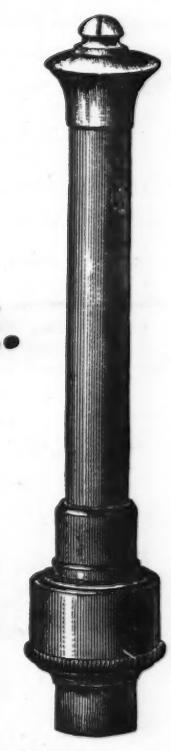

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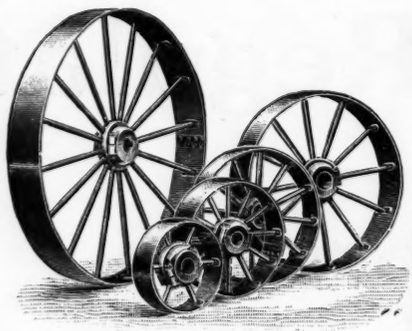

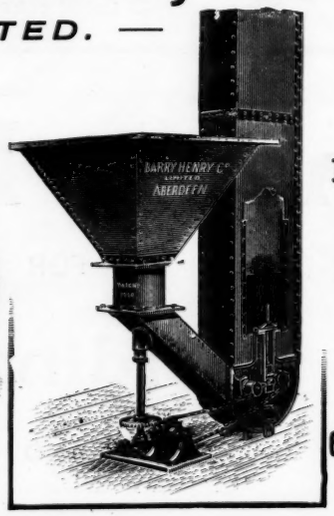

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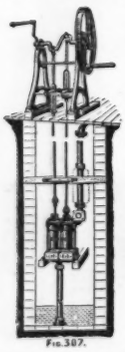

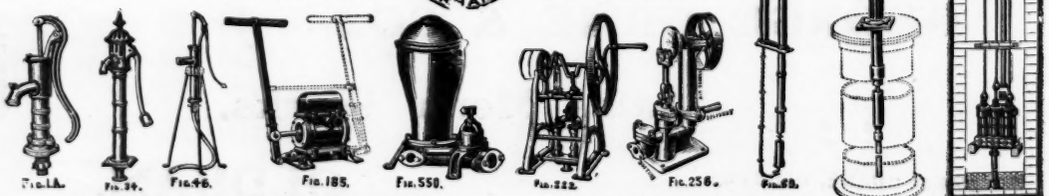

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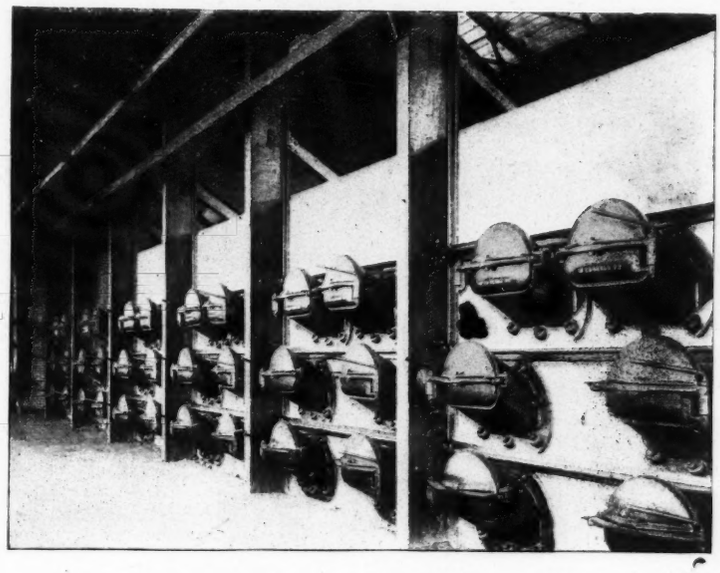

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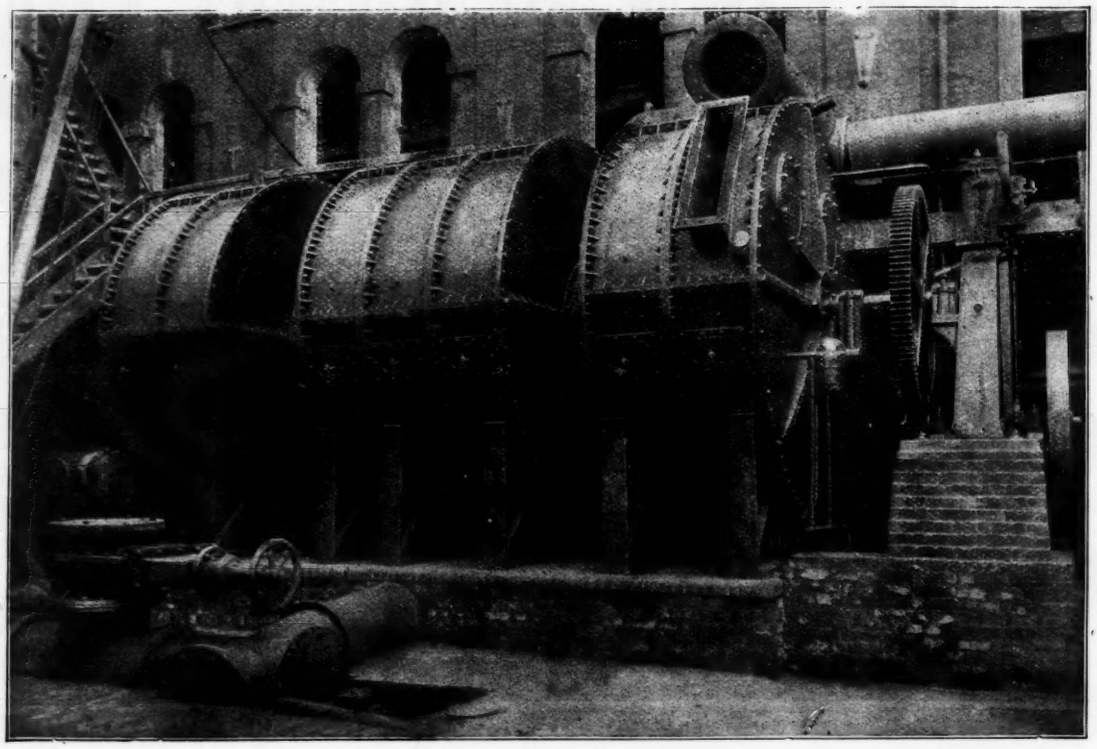

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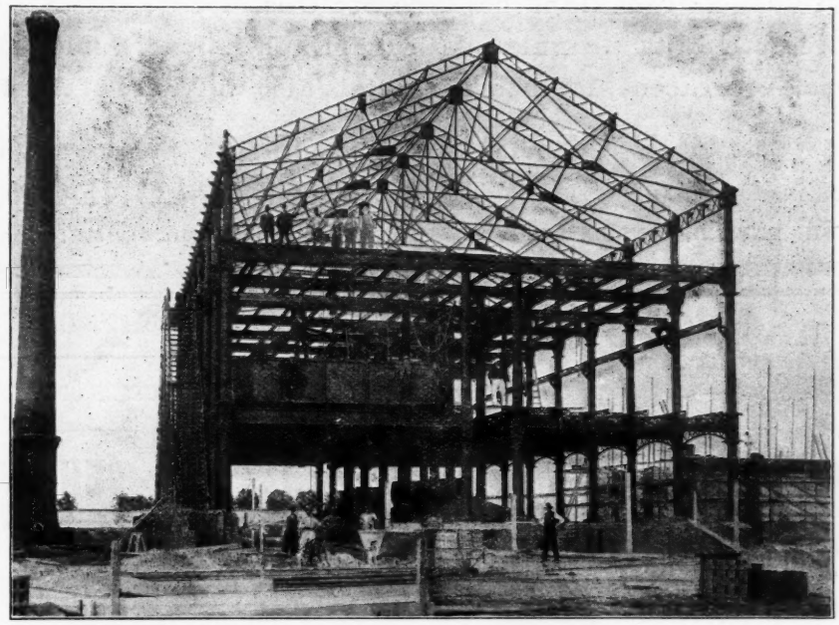

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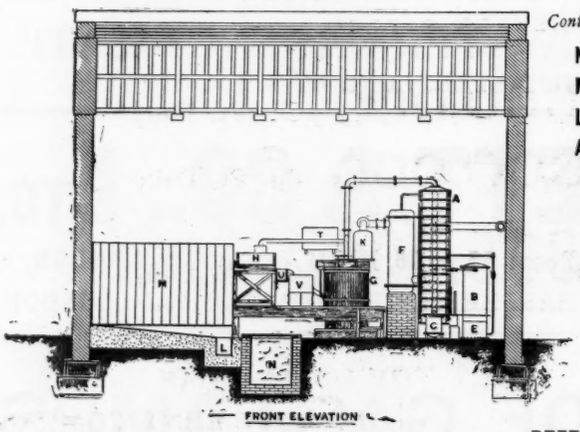

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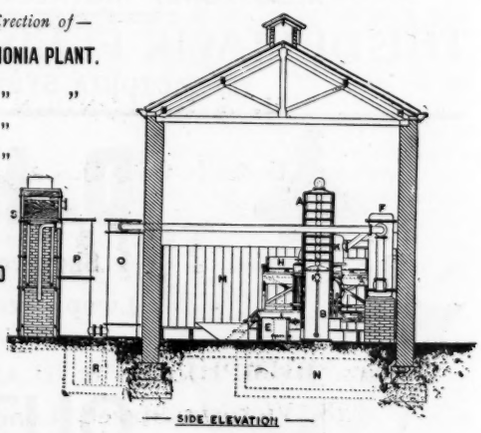

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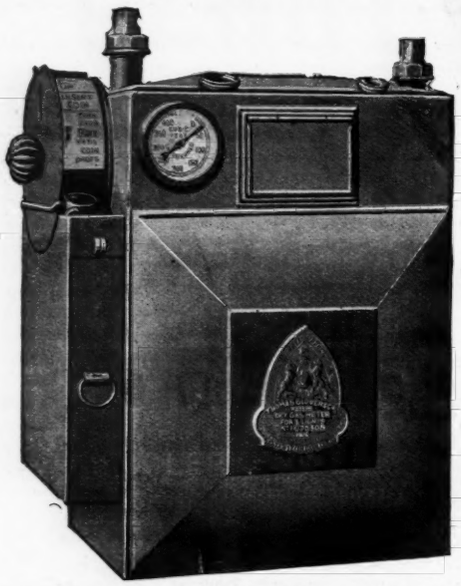

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EDITORIAL NOTES—GAS, &c.

In the Interest of Free Labour.

IT is being remarked on all sides, by the periodicals and journals devoted to the principal British industries, that the New Year has begun under more peaceful conditions in regard to labour than have prevailed for many winters past. Speaking for one of these great national industries, we are able to swell the volume of testimony to this effect. There are no strikes in progress, nor any sound of the kind; notwithstanding the fact that the Old Year closed amid very general and sweeping announcements of reductions of wages in some important trades, and of short time in others. Of course, so far as the gas industry is concerned, there will be no reductions in rates of wages corresponding to those of other occupations which derive their labour from the same sources. This is a point which is perfectly well understood among gas workers; but it is nevertheless expedient that the fact should be mentioned at the present time, when other labour is once more experiencing slackness of demand for workmen, whether skilled or unskilled, and falling wages. Gas workers' wages are invariably raised whenever wages generally are increased, for the obvious reason that there can be no exception to such a universal movement. But they are never reduced again in sympathy with outside wages. This is something for those concerned to remember. We do not mention this characteristic of gas workers' wages in order to ascribe any meritoriousness on this account to the employers of such labour. It is merely one of the incidents of this employment which it displays in common with some others, such as the national and municipal services. But wage-earners who are not liable to suffer from the common consequences of bad trade, and are almost wholly exempt from the obligation to take the rough with the smooth, must bear the fact in mind during good times for trade as well as at periods like the present. It is hardly too much to say, that all the labour troubles of the past in gas-works were stirred up by casual hands from outside, who had no understanding or experience of this characteristic of the employment. These outsiders came in with heads full of the promises and imagined powers of Trade Unionism; and it is matter of history how their agitation was supported by people of another class who had even less knowledge of the conditions of employment in gas-works. This phase of the industry has passed away; and gas workers of the present day are not under any delusions as to the side on which their bread is buttered.

The phenomenon of the quiet submission to these vicissitudes of their employment of workpeople in the trades which are working short time, or at lower wages, is a striking refutation of the claim always preferred by the professional rulers of Trade Societies, and unthinkingly accepted for the truth by politicians and others, that these organizations have the power of regulating wages. It may be believed, without much risk of error, that if the Unions connected with the trades that are actually suffering from restricted employment and diminished wages had possessed any of the power claimed for them, these conditions would have been resisted to the uttermost. Why are not all the workpeople afflicted by these disadvantages out on strike? For several reasons, which it will be as well to place upon record for the edification of those who profess respect for the Trade Unions of the country, as at present conducted. Of course, we have nothing to say about theoretical Trade Unionism—such as appeals directly to the sentimental regard of the Friends of Humanity of all nations. We never saw anything of the kind in operation; and, as a matter of fact, it does not, and never did, exist. The only Trade Unionism known to our practical life is the kind that was sown broadcast in 1889, flowered at Bethesda, and bore the bitter fruits of the Taff Vale judgment. There are no strikes in the "organized" trades, because the wirepullers know they would fail; and most probably those who connived at and took part in them would be laid by the heels for acts of intimidation or violence, while the Societies would have to pay the piper.

This is why the merry old game of striking, as it used to be played by the professionals, has gone out of fashion in Trade Union circles in England to-day. It does not do to be over-sanguine, but we would fain hope that the supremacy of the liberty of the subject over the class tyranny of Trade Unions has been securely established in this country. There still remains something to be gained in the same way, by constitutional process; and that is, the deliverance of industry from the restraints on production enforced unblushingly by every Trade Society that has the power of acting in this sense. There never was a greater delusion than the belief, common outside industrial circles, that Trade Unions are reconciled to machinery or other agencies for the increase or throwing open of production. Mr. Chamberlain's Commission will fail of its opportunity if it does not procure conclusive evidence of the way and extent in which trade is being driven out of the country by Operatives' Unions. We fancy English gas-meter manufacturers could say something about this, if they would. Failing them, there are plenty of others who could tell the same tale. The bludgeon of the bully who half-murders a "blackleg" injures the country less, perhaps, than the secret counsels of the sleek society wirepuller who is personally incapable of violent outrage, and owns a snug batch of cottage property.

It is no consolation to reflect that the state of labour in the United States, for instance, is far more desperate now than anything experienced in this country since the days of Broadhead. We have received advices from good friends "on "the other side," to the effect that the great Commonwealth will have to face the extermination of industrial rebellion as it did the forces of Secession; and that the conflict will perhaps not be delayed beyond the current year. We may heartily wish them a good deliverance, and employ ourselves in the meanwhile in putting our own house in order. After such news respecting the actual conditions of labour and employment in the United States as we have reported of late, it may be easily believed that drastic treatment will be needed to excise the canker that is eating into the vitals of the community. Such treatment will be applied. No one who knows the race which still dominates the Continent can entertain any real doubt on this score. The work may set back for a season the industrial development of the land; but it will be thoroughly effective, though at awful cost. The eternal laws of fair and equal dealing between man and man, once recognized, must be upheld though the heavens appear to fall. They will not fall, really, unless injustice is condoned and permitted.

The Trade in Distributed Power.

OUR esteemed contemporary the "Electrician" begins the year with a table exhibiting at a glance the principal characteristics of the electricity supply undertakings of the United Kingdom. In an article explaining the contents of this valuable compilation, certain remarks occur which are particularly interesting and suggestive for gas engineers. It is admitted, for one thing, that the use of arc lamps for street lighting does not materially increase. Several reasons are offered to account for this circumstance; the first to be mentioned being the disappointing result of the introduction of arc lamps of the Bremer or flaming type. It is remarked that on the first appearance of these lamps there were those who prophesied that they would revolutionize electric lighting. Unfortunately, it is confessed, this has proved to be of the number of those electricians' prognostications which were not justified. The lamps have not commended themselves for public lighting; and the prospects of anything like a large extension of the employment of arc lamps of any description in the case of the older and larger undertakings are regarded as bad, in view of the "strenuous efforts now "being made by gas companies to meet the competition of "electric light." It is gratifying to learn that these efforts are felt, at any rate.

Another point that is emphasized by our contemporary's

information is "the steady, and in some places extremely "rapid, increase in the motor connections." Frankly, we regard this as a piece of bad news. It goes to show that the reckless offer of the "penny unit," regardless of cost, is telling on the business in power distribution. The gas companies really must bestir themselves over this. All manner of results are catalogued as following upon the discovery of this successful bait. Alternating current systems are being abandoned for the continuous current, largely on account of the power branch, which does not flourish so well with the former. It is remarked that the difficulty of overlapping is sought to be obviated by offering current at an extremely low price, provided the customer will agree to abstain from taking it during "peak" hours. Stepney and Brighton are cited as cases in point; and now Maidstone has followed.

We will say this for managers of electricity supply undertakings—they are very much on the alert, and they do read their technical journals in order to keep posted as to one another's doings. As soon as a promising trading device is hit upon in one corner of the kingdom, it flies far and wide. Unfortunately, as is confessed, this time-limit offer shares, with some other electricians' happy thoughts, the drawback of being conceived in the first place in the interest of the supply authority. It is indicating to the consumer what the sellers of the commodity would like, rather than suiting his convenience; and it remains to be seen how far an offer so conditioned will succeed. We can scarcely believe that it will answer. It is, however, very clear that, wherever it is tried, the opportunity is presented to the gas company for making play with the fact that no such limitations attach to the consumption of gas for power or any other application. We are firm believers in the commercial principle of making prices to suit the customers; but we have never been able to accept the Wright system on the claims advanced for it. That this system of charging has anything like the effect ascribed to it as regards improving the load-factor of supply stations, certainly cannot be proved by the mere coincidence of a good load-factor with the employment of the system in such localities as Stepney. It is difficult to believe that people will go on using a light for any length of time, for any cause except for their own convenience; and this would be the same with any method of charging for the light. This, of course, is not to say that the system referred to is not popular, with such as understand it and see that they benefit by it. The question remains, however, as to how a consumer really stands affected, if his wants amount to a unit an hour for four hours a night, between the alternatives (say) of 8d. for the first unit and 2d. for the balance, or a flat rate of 3½d. per unit. Would he be a consumer under the former condition, but not under the latter? It is doubtful.

The Gas Undertakings Returns.

THE gas undertakings returns have been published, and they bring the authoritative statistics of the statutory gas undertakings of the United Kingdom down to the end of the year 1902 in the case of the Companies, and to last Lady Day for the Local Authorities. The number of Companies included in the return remains at 454, as in 1901; but that of Local Authorities owning gas-works has risen from 251 to 256. The grand total of undertakings included in the returns is therefore 710. The gross amount of capital authorized is £133,574,335 of which £112,867,060 is actually paid up and borrowed. It would, of course, be more if all the Companies had converted their capital, like the largest of them and many others. The total receipts of the undertakings amounted to £26,760,076, which is about 23 per cent. on the capital employed. This speaks very well for the earning power of money put into gas. The total expenditure was £20,382,688, which is 76 per cent. of the revenue. The weight of coal carbonized was 14,109,219 tons. Besides coal gas, 16,867½ million cubic feet of carburetted water gas were made and sold. The sales of acetylene gas from public works amounted to 84,287 cubic feet. The mileage of mains was 29,144; the number of consumers on the books was 4,168,725; and the number of public lamps lighted, 628,136. As bearing out the remark made in another of the present "Notes," this last number exhibits an increase. Only once in the Companies' record—and never in that of the Local Authorities—did the tale of public gas-lamps lighted show a falling off. This was in 1901; but the progression has now recommenced, and the total number of public street gas-lamps lit nightly is larger than ever.

As usual, numerous reflections arise in one's mind, and suggestions occur, when turning over these pages of gas statistics. Some engineers would propose the addition of a column for information as to sulphur purification, which certainly is a difference between some undertakings placed in close neighbourhood in these returns. Opinions differ, also, as regards what is meant to be included in the column under the heading "Nature and Quantity of other Materials" besides coal used in the manufacture of gas. Some return coke and water used in making carburetted water gas; others omit everything besides the oil. The single acetylene gas undertaking, at Portsoy (Banffshire), well deserves a line of recognition. It claims to sell 30-candle gas at 6s. per 100 cubic feet, and cleared a profit of £124 on the investment of £1560. The gas does not appear to carry very well, as out of 107,319 cubic feet made only 84,287 cubic feet was paid for. The returns of the Local Authorities, as usual, may be quoted on either side of the question as to municipal trading. Those who admire "profits" will find numerous examples of them; while they will, also as usual, overlook the consideration that the gas might be cheaper.

The Parliamentary Expenses of the London County Council.

A NOTEWORTHY White Paper has just been issued by the Local Government Board, in response to an order of the House of Lords moved for by the Earl of Camperdown, setting forth all the expenses incurred by the London County Council in promoting and opposing Bills in Parliament in each session from the establishment of the Council up to and inclusive of the year 1902. Lord Camperdown is no enthusiastic admirer of the County Council; and it will probably not be doing him a great injustice if one ventures the guess that his motive in asking for the return was the suspicion that the Council had not made the best use of their unique powers for engaging in parliamentary promotions and oppositions. If so, the motion for the return will probably be held by his Lordship and others to be justified by its contents. For the facts are plain enough.

The first thing the figures given in the return show is that the Council during the first fourteen years of their existence made the ratepayers pay £263,836 for parliamentary expenses. Whether there was value received by the public for this outlay, is a question on which there will be a difference of opinion. The Council began mildly enough; for the first five years their total parliamentary expenses never reached £15,000 a year. After this period, however, all the parties concerned in this branch of the Council's business seem to have felt their power; and the costs mounted up merrily. If this increase of parliamentary activity had been forced upon the Council, in their capacity of custodians of public interest, by unjustifiable promotions, the expense would have shown itself chiefly under the head of oppositions. This, however, is not the case. For the first thirteen out of the Council's life of fourteen years, the amount they expended on oppositions only averaged about £5000, which may be taken as roughly representing the cost of defence. Even for 1902, which was the heaviest year, the expenditure under this head only amounted to £13,354. This included the oppositions to the South Metropolitan and Commercial Gas Bills of the year named. While the total expenditure on oppositions, however, was £78,503, the Council spent no less than £185,332 in promoting Bills, the greater number of which failed to pass. It is difficult to arraign the policy of the Council in this regard on a definite ground, so as to arrive at a just conclusion as to the character of the stewardship exercised in this form by the majority of the Council year by year. Whether account be taken of the number of the Bills that failed, the sums spent upon their promotion, or the nature of the projects involved, the tale seems to accuse the Council of recklessness, and in some respects of infatuation. Large amounts were lavished on what was dignified by the name of the "water policy" of the Council, which led to very little; and a good deal also went to support the equally persistent "tramway policy," which cannot be discussed here. Possibly the majority of the Council themselves did not realize how much money was going out in this way; in which case the return will serve to enlighten them, and may tend to economy.

The Relationship of Gas and Electricity.

From what standpoint should gas and electricity be regarded, when both undertakings are under the same ownership—that of the local authority? Should they be looked upon as rivals, as being in harness together, or as strangers, neither one troubling about the other? So long as both are being carried on at a profit, the question does not call for an answer? But supposing both are not equally successful—and such a thing has been known to happen—how should the relationship be regarded then? One particular case may be mentioned, for example, where, of all the trading departments of the Corporation, the only paying one is the gas-works. There is, of course, nothing new in this; for gas supply is far and away the most profitable business which municipalities have ever undertaken. What, however, does give rise to reflection is an argument which was (unsuccessfully) trotted out against a proposed reduction in the price of gas; it being said that, as the electricity works are now, and are likely to continue to be, carried on at a loss, the price of gas should be kept up in order that as large a sum as possible might be handed over in relief of the rates. This view favours the "running in harness" theory; and its adoption would of necessity throw an undue share of the burden on the stronger partner —the gas consumer. Then, in another instance, the Chairman of the Gas Committee, on a proposal to extend the cables for electricity, has been pleading (also unsuccessfully) for an agreement between the two departments to put an end to the present "cut-throat competition" between them, as the receipts from the gas-works are going down. Had this proposal been agreed to, it would have amounted to an admission that the two departments are rivals who would do well to come to terms; its rejection seems to be an acknowledgment that each business should be carried on quite independently of the other. It thus appears that both the Councils referred to regard the matter in a sound light. The gas consumer should not be called upon to pay a share of the cost of his neighbour's electricity; nor should the user of current be asked to bear part of the burden of the man who favours the older system. By the adoption of this rule, the gainer will usually be found to be the gas consumer.

The Monazite Sand Question.

The shuttlecock play that seems to be proceeding in connection with the monazite sand contract is getting exasperating; and it is difficult to hold as settling any particular aspect of the question the various reports that reach us. Official intelligence is to hand this week to the effect that the Brazilian Minister of Finance has accepted tender No. 2 for the concession to work the monazite sands. The heads of the various tenders received were published in the "JOURNAL" for Dec. 8 last; but there were others expected from London. About the latter, nothing more has yet been heard. But, as then stated, tender No. 2 was by a Russian Engineer, resident in Bahia; and he offered, among several other conditions, to pay to the Federal Government a premium of £5000 and 50 per cent. of the gross value of the sales. The minimum price was to be fixed at £25 per ton for the rough sand, and £95 per ton of prepared or sifted sand; it being stipulated that a minimum quantity of 1200 tons of rough or 250 tons of prepared sand should be shipped annually, with a yield of thorium equal to 6 per cent. per ton of the rough sand. But with the same dip of the pen that tells the news of the success of tender No. 2, H.M. Minister says "there is no likelihood of its being carried into effect." The ground for this belief in all probability is to be found in the proposed Governmental geological survey of the deposits of the sands, with a view to ascertaining their extent and value, in order to determine the conditions on which such deposits shall be leased. If this is so, it is difficult to understand what moves the Brazilian Minister of Finance to go through the farce of accepting one of the tenders. If, on the other hand, there has been a *bonâ-fide* acceptance of No. 2 tender, then it looks as though it simply removes the local monopoly from one pair of shoulders to another. Meantime, the report is being circulated that a steamer arrived at Hamburg a few days ago with a cargo of 930 tons of monazite sand, and an additional supply of 600 tons is on its way to Europe. The report does not emanate, so far as we know, from an official source, and who, therefore, can place any reliance in it? If accurate, it would certainly place all mantle-makers in a comfortable position for some time to come.

The Sulphate of Ammonia Market Last Year.

Messrs. Bradbury and Hirsch, of Liverpool (as will be seen from another part of the "JOURNAL"), have issued their "Review of the Market for Sulphate of Ammonia during 1903." These reviews have for years been noticed in our pages; and interest in them has increased with time. The manufacture of sulphate of ammonia is now so largely associated with gas making, that the course of the market for this product in the past and its probable position in the near future are questions which touch very closely the owners and managers of gas undertakings. For these, among others, the "Review" has been prepared; and they will do well to take note of its contents, either in the form in which they are here presented or in the pamphlet itself. It is satisfactory to learn that the low-water mark in the sulphate trade has now receded well into the past; and that the average price last year —£12 9s. 2d. per ton f.o.b. Hull—exceeded expectations. This figure is low compared with the average in 1882, which was £20 8s. 6d.; but, on the other hand, it is a vast improvement on the £7 18s. of 1896. This figure, it may well be hoped, has been left behind for ever. The estimated production last year is put at 234,000 tons, compared with 229,000 tons in 1902; being an increase of 5000 tons. This is attributed mainly to the coke and carbonizing works and those making producer gas; 3000 tons being placed to their credit, and 2000 tons to gas-works. There is less by 500 tons put down to iron-works; but this is compensated for by an increase to this extent from shale works. With regard to the outlook, though there is not a very pressing home demand, Messrs. Bradbury and Hirsch believe that the requirements of the Colonies, Japan (presuming hostilities do not break out with Russia), and the Pacific will carry prices beyond their present level in the near future, and, with other demands, will keep the market clear of stock for some time to come.

Drawing upon the Imagination for Facts.

The question asked by the Roman Governor on a certain memorable occasion—"What is truth?"—has been repeated by many men, though in probably a much less concise form, in the course of the nineteen hundred years which have elapsed since the inquiry was made, but we venture to think by none more frequently than by those to whom Fate has assigned the duty of preparing for permanent record accounts of events which they do not themselves witness, and for the details of which they are necessarily dependent upon others. We have it on the authority of a great historian that "minds differ as rivers differ;" and evidence is furnished every day, through the ordinary channels of information, of the extent to which the "personal equation" enters into the recounting of all events. Newspaper reporters, useful public servants as they unquestionably are, only too frequently appear to be more impressed with the desire to make "copy" than with the fact that they are also making "history." And as the historian already referred to was not, according to certain of his critics, very particular as to the accuracy of some of his statements so long as the language in which they were embodied rolled on with magnificent grandeur, so the "liner" is far more anxious to send in to his paper some highly coloured story that will produce a sensational headline, than to follow the example of Othello, and tell "a round, unvarnished tale." This tendency to exaggeration, which is really untruthfulness—or, in less euphemistic Anglo-Saxon, lying—was strikingly exemplified in the case of the accident to the labourer in the service of the Cambridge Gas Company reported in the "JOURNAL" last week. The accounts of the occurrence, which was quite sad enough without being magnified, that were first sent broadcast over the country were that the man was "literally roasted alive." A day or two later a different version of the affair came to hand, followed by the paragraph containing the roasting alive incident as "another account." At the inquest, as may be remembered, the medical witness who made the *post mortem* examination of the unfortunate man attributed his death to internal injuries, and stated that there was no mark or trace of burning upon either the body or the clothes—the flame of gas being, in fact, some 3 feet distant. This is only another proof of the necessity for taking the first reports of an accident, especially when it occurs in connection with a gas undertaking, with a little salt—not a grain merely, but a good spoonful. The occurrence in question naturally aroused considerable interest in Cambridge; and the Secretary of the Gas Company (Mr. A. E. King) has very properly

protested, on behalf of the Directors, in a letter to the "Cambridge Chronicle," against the exaggerated accounts of it which were circulated by some local correspondents. He expresses the hope that they will in future "confine themselves to facts and avoid fiction, though the latter may be attractive in so far as it is sensational." We cordially unite with him in the expression of that hope, not only with respect to correspondents in the University city, but all over the country. We yield to none in appreciation of men like Dumas *père*, Harrison Ainsworth, and others, who possessed the wonderful power of presenting facts in the agreeable form of fiction, but object to fiction being foisted upon us for facts. In our craving for these, so far as they bear upon the gas industry, we confess to being veritable Gradgrinds.

Advertising a Maintenance System.

A correspondent, referring to the article in last week's "JOURNAL" on the subject of the price of gas, states his opinion that the money given away in reducing the charge per 1000 cubic feet, would, if spent in advertising, canvassing, and other similar ways, yield a much better return. In the matter of advertising in the local papers, gas companies do seem to be doing more than used to be the case; for it has become quite a common thing to see the advantages of their commodity prominently brought to the notice of readers in this way, sometimes accompanied by illustrations of up-to-date fittings, &c. This is, of course, by no means the only available method of advertising. A maintenance system is of great value in this regard, as by this means the company or local authority are able to take care that gas lighting is seen at its best. Our correspondent, however, naturally thinks that, besides the gas supply itself enjoying the advertisement which constant attention to the burners and mantles gives it, he should have the credit of the efficient maintenance. As he says, "good work is a good advertisement, provided the public know who do the good work;" and accordingly he set himself to devise a means of supplying the public with this information. The result is a small dark green bevelled card, neatly lettered in silver, which is intended to be hung up conspicuously in premises where he maintains. The inscription which the card bears is a simple one—"The lights on these premises are kept in order by the gas company." The only thing that remains to be done is to induce the occupier to place the intimation where it may be readily seen by all whom it may concern; but from our knowledge of the ways of some gas consumers, we are inclined to think that occasionally this may prove the hardest part of the matter.

A City Council and Premium Pupils.

Many people in Leeds must have been surprised, on opening their papers last Thursday morning, to find that on the previous day the City Council had decided to refer back to the Gas Committee a proposal that permission should be given to the General Manager (Mr. R. H. Townsley) to receive two premium pupils in his department. No one, however, must have been more astonished than Mr. Townsley himself at the turn affairs had taken, for at the meeting of the Gas Committee the desired permission was readily, and practically unanimously, accorded. There was the less reason to anticipate this reversal of the Committee's recommendation, seeing that in the Town Clerk's Office, the Borough Engineer's Office, and the Sanitary Department a similar favour has always been allowed. Doubtless in consequence of the unanimity with which the proposal had been agreed to by the Gas Committee, no opposition on the part of the Council was anticipated; and when the matter was brought up, the members present had dwindled down to a very small number, owing to this part of the proceedings having been preceded by a long and wearisome discussion on the subject of the demands of the tramway men. This much, at any rate, is clear from the fact that, shortly after the recommendation was referred back, the meeting was counted out, and the remaining one or two items of business had to stand over. However, it is stated that the matter affecting Mr. Townsley is to be brought up again, and that then members of both parties who were not in the Council Chamber when it was discussed last week will support the original proposition to grant him so reasonable a concession as the one indicated. Surely, it is not out of place for a Corporation, in little things like this, to show their appreciation of a good servant. Mr. Townsley's department is responsible for the yearly expenditure of an enormous sum of money; and it would be hard indeed if he were to be denied, as the result of this chance vote in the Council, a privilege from which he would derive some small benefit, while it would not entail any outlay whatever upon the Corporation. It would certainly be unfair to make an exception in this case, while other officials under the Corporation, who are in receipt of higher salaries, are already in enjoyment of the concession which the Gas Committee recommended should be allowed in their department. We can only wish Mr. Townsley "better luck next time."

London Gas Affairs from a Distance.

A North of England newspaper, in drawing attention a few days ago to the recently announced reduction in price by the South Metropolitan Gas Company, takes occasion to point out the difference which exists between the charge made by that undertaking and by the Gaslight and Coke Company. Its readers are then treated to the following piece of news: "Most of the consumers of gas of the last-named Company are on the northern side of the Thames, though there are also a tolerably large number on the southern shore of the river, and in some cases the Companies march together in the same street; so that while those on the one side obtain their gas at 2s. 1d., their neighbours across the way have to pay 3s.—an anomalous state of things naturally productive of much discontent and indignation." It is difficult to see what interest the general body of newspaper readers in the North can have in "Gas Anomalies" in London; but anyhow the facts might just as well have been given correctly. The inaccuracy of statements made by the newspaper Press in regard to gas affairs is, however, a matter which we have so frequently found cause to lament, that it seems hopeless now to expect anything else.

WATER AFFAIRS.

Municipal Ambition—and its Cost.

IF there is one characteristic more marked than another in an ardent municipalizer, it is the light-hearted, irresponsible manner in which he embarks upon ambitious schemes or prosecutes "fads" which entail the expenditure of a large amount of the possibly hardly-earned money of those whose interests he is supposed to protect. During the publication of the articles upon municipal trading which appeared in "The Times" about eighteen months ago, a striking instance was recorded of recklessness of this kind displayed by a member of the Corporation of a new borough in the eastern suburbs of London. On being remonstrated with for advocating a scheme involving the expenditure of some thousands of pounds, for which, if we remember rightly, there was no immediate necessity, he coolly replied that he should not care if the amount were millions. It is no doubt this attitude on the part of the members of the governing body which has brought the borough in question into the distinguished position of being the most heavily rated one anywhere in the neighbourhood of London. These remarks are prompted by the publication in the past week of a return, moved for last summer by the Earl of Camperdown, of all the expenses incurred by the London County Council in promoting and opposing Bills in Parliament. The statistics presented refer to each session from the year 1889 to that of 1902; and they are introduced by a note—brief but significant—to the effect that they were prepared in the office of the Council for submission to Parliament, and are "issued "without comment." The figures are therefore left to speak for themselves.

And what a tale they tell! In the period named, the Council spent no less than £185,332 in promoting, and £78,503 in opposing Bills; making together £263,836 in fourteen years, or at the rate of £18,845 a year. It is not our purpose to criticize in detail the items which make up the large expenditure stated above, but only to call attention to certain of them. Everyone knows that the County Council inherited from their predecessors a strong antagonism to the London Water Companies, and an indomitable ambition to wrest their properties out of their hands and get them into their own. In the prosecution of this laudable scheme, they have spent no less than £88,690—£63,871

being for the promotion of Bills, and £24,819 in opposing them. No less than £26,161 has been expended over the abortive attempt to purchase the undertakings, and £14,650 in connection with the Welsh scheme, which was to bring to London, at vast expense, an additional supply of water for which there is no immediate need—the stores at hand being ample to meet all requirements for some years. On regulation, where the Council might possibly have intervened with advantage, the enormous sum of £142 has been spent; while the general expenses of the Water Committee are put at £21,539! The Council claim that their action in promoting Purchase Bills has aided materially in solving the London Water Question, and that their labours in connection with the inquiry before the Select Committee of the House of Commons in 1895 paved the way for the successful passing of the Bill which constituted the Metropolitan Water Board. This may be the opinion of the Council; but it ill accords with the remarks made by the President of the Local Government Board when introducing the Bill. Mr. Long told them plainly that they had dealt with the Water Question in a way which had not secured for them the confidence either of the House of Commons or of the community at large; the result being that their own conduct had militated against the passing of the measures they had brought forward to attain the coveted object. The Council also take credit to themselves for having originated the "sinking fund" and the "non-enhancement" clauses, about which so much has been heard in the course of the arbitration proceedings. Whether the water consumers and the ratepayers of London will eventually derive any benefit from the Council's interference in these matters, remains to be seen. At all events, the conclusion forced upon one by a glance at the figures in the return, apart from any critical analysis of them, is that the advantages will have to be considerable to compensate for the enormous outlay incurred in procuring them.

The Control of Rivers and Streams.

In the last number of the "Journal," we offered a few suggestions as to the questions more or less closely connected with water supply which might be expected to occupy attention during the current year; and the purification and conservation of rivers was instanced as a subject about which something more would be heard in the next report of the Royal Commission on Sewage Disposal. Curiously enough, that report was probably in the press when our remarks appeared. At all events, it is dated the 28th ult., and was issued on Friday. As was anticipated, it contains further references to river pollution and to the necessity for the creation of a Central Authority to take supreme control of the watercourses of the country. The proposal, it may be remembered, was originally made in the previous report; and it is now repeated with emphasis born of further consideration of the subject and the hearing of more evidence bearing upon it. It has been made plain to the Commission that, in a general way, the existing statute law does not prohibit the discharge of polluting liquids into tidal waters; and as they are satisfied that injury to health may arise in consequence of this laxity, they consider some alteration in the law is required. This is the initial step suggested in the direction of reform. The next is the placing of tidal waters under the jurisdiction of a competent authority, and conferring upon it power to enforce restrictions in regard to pollution. Some of the witnesses made the suggestion that the control of the rivers should be solely in the hands of the Central Authority; but the Commissioners were unable to adopt it. They considered that local power could be utilized with advantage, and that the central body should usually act as a court of appeal. This was the view of witnesses representing local authorities, who generally agreed that efficient control might be exercised through the machinery of large River Boards. The jurisdiction now exercised by the Boards over inland waters is precisely such as is required in the case of tidal waters; and the Commissioners recommend its extension thereto—subject, of course, to appeal to the Central Authority. The procedure to be adopted is explained in the report, and though, in the main, it relates to the preservation of fish, it cannot fail to effect improvement in the condition of rivers. Dependent as we are so largely upon these sources for one of the principal necessaries of life, the suggestion of the Commissioners deserves attentive consideration as having a most important bearing on public health.

THE GAS AND WATER STOCK MARKET.

The general position of things on the Stock Exchange has not undergone any practical change during the past week, just as its ruling influence—the situation in the Far East—has itself undergone no change. And so long as Peace and War hang poised in equal scales, so long probably will the Stock Markets remain in suspense. Hopes and fears alternated, changing quickly during the day; on several days the afternoon prices were good after a very flat morning. Consols touched 86⅝ on Thursday—a low-water mark. However, the tone at the close was better, and the last prices, though showing a shrinkage from the opening figures, were above the worst. The Money Market ruled very easy in the early portion of the week, but stiffened appreciably later on; and discount rates were firm. Business in the Gas Market was moderately active, taking the week all through, though on one or two days it fell very calm. Changes in quotation were neither numerous nor considerable in degree; and, in point of direction, they were about evenly balanced between the ups and the downs. In Gaslight and Coke issues, the ordinary was fairly active on most days, but it underwent a reaction from the advance it had made during the previous weeks, and lost the two points it then gained. The opening figures were good—90 being marked more than once; but it fell away to 87 on Thursday. However, there was some recovery before the close. The secured issues were very quiet. The maximum advanced a point, but the preference was not well supported. South Metropolitan was not much dealt in; but it added another point to its quotation. The transactions marked ranged from 117½ to 119½. A single bargain in Commercials, at middle figures, was all the record. The Suburban and Provincial group displayed more activity than of late, with dealings in Brentford, British, and West Ham. In the two first, prices were good; but the latter was quoted lower. In the local Exchange, Liverpool "B" receded a point. Transactions in the Continental Companies were very limited; and prices generally were easy. A parcel of Union was let go "specially" at 115. Among the more remote undertakings, River Plate rose, and Ottoman fell. In the Water Companies, business was fairly active during the week, with a downward tendency in prices. Southwark led the way with a drop to the extent of 10 per cent.; New River and West Middlesex had lesser losses; Chelsea advanced.

The daily operations were: Gas opened firm on Monday, and was fairly brisk. South Metropolitan improved 1. Tuesday maintained the same position, and Gaslight maximum rose 1. In Water, Chelsea rose 5; West Middlesex fell 2½. Wednesday was quiet, and rather droopy. Gaslight ordinary moved down 1, and West Ham ½. Southwark Water fell 3, ditto debenture 1. Thursday was more active, but prices were no better. Gaslight ordinary receded 1, and Ottoman ½; but River Plate rose ¼. Southwark Water fell 6. Friday was a quiet day. Gas quotations were unchanged. In Water, Grand Junction and Southwark relapsed 1 each. Saturday was brighter, and Gas prices improved; but quotations were left standing. In Water, Grand Junction recovered 1; but New River fell 5.

GAS BILLS FOR 1904.

(*Continued from p.* 20.)

The Arlesey Gas Bill is to extend the limits of supply of the Company authorized in 1901 to include certain parishes in Bedfordshire and Hertfordshire, with the obligation to purchase the undertaking of the Shefford Gas Company, Limited. The capital is to be increased by £9000. Preference shares are to be offered by auction. Borrowing powers are desired in the proportion of one-third of the amount of the new issue.

The Bexhill Water and Gas Bill contains a part relating to gas. The capital is to be increased by £120,000; and all the loan capital is to be brought up to the proportion of one-third. The limits of supply are to be extended. Consumers' fittings may be specified; and the usual modern gas clauses are proposed to be enacted.

The Blyth and Cowpen Gas Bill is to sanction additional gas lands, and to consolidate and increase the capital of the Company by £100,000 in 5 per cent. ordinary stock. A renewal fund is proposed. Any stock issue unsold may be offered to consumers and employees. The borrowing powers are to be in the proportion of one-third. Debenture stock is to be offered by auction or tender. Power is sought for selling gas in bulk within or beyond the limits, and to grant discounts up to 25 per cent. in consideration of prompt payment. Gas of 14-candle power is to be supplied after Jan. 1, 1905, tested by the "Wandsworth" burner with a 6 in. by 1⅛ in. chimney and table photometer with 10-candle pentane standard. Certain alterations are to be made in respect to the holding of the Company's meetings and the directorate. New candidates for election to the Board must have been qualified for six months prior to election; and notice of their candidature must be given to the Secretary and posted in the office ten days before the day of election. Demands not exceeding £100 are to be recoverable in the County Court. Additional gas lands are to be acquired.

The Colney Hatch Gas Bill is to alter the name of the Company to that of the Southgate and District Gas Company. Additional gas lands are to be acquired, involving the stopping-up of a public road. The compulsory powers for the purchase of land are to be exercised within five years. A delimitation agreement with the Tottenham Company is to be confirmed. The capital is to be increased by £120,000. Unsold issues may be offered to consumers. Borrowing powers are to be in the proportion of one-third. A renewal fund is proposed. Tenants are to be liable for sub-tenants' gas supply. The remuneration of the Secretary is to be determined by the Directors. Discounts up to 20 per cent. may be allowed.

The Croydon Gas Bill is to alter the name of the Company from that of the Croydon Commercial Gas and Coke Company to the Croydon Gas Company. The capital is to be increased by £300,000 in "D" stock, bearing a fixed maximum 5 per cent. dividend, ranking *pari passu* with the existing "B" stock. New issues may be advertised in the local newspapers, and applications invited for its purchase at a fixed price, which is to be as near as may be the average market price for the previous month of this or similar stocks of the Company. The borrowing powers are to be increased to one-third of the stock issues. Debenture stocks are to be issued by auction or tender. The sliding-scale and other provisions relating to capital are to operate half-yearly instead of yearly. The formation of a renewal fund is proposed. Additional land is to be acquired.

The Crystal Palace District Gas Bill is to change the name of the Company to the South Suburban Gas Company. The illuminating power of the Company's gas is to be 15 candles until January 1, 1905, and 12 candles thereafter. Sugg's "Wandsworth" argand is to be the test-burner, with the gas consumed at such a rate as shall yield the maximum amount of light for which it is designed. The table photometer and the 10-candle pentane standard of light are to be used at the testing-places, which are to be those prescribed by the Act of 1893. Within two years after January 1, 1905, the Company will, on demand, supply and fix gratis flat-flame burners adapted to produce the best light obtainable from the gas supplied. They will also provide and fix in the residential rooms of any house not more than six incandescent burners instead of the new flat-flame burners. The initial price is to be 3s. 2d. per 1000 cubic feet with a neutral zone to 2s. 10d. for increase of dividend. New stock issues are to be offered first to consumers and employees at the average price of the previous month. A scheme for the election of workmen directors may be prepared when the holding of stock by the employees of the Company exceeds £10,000 nominal. The Bermondsey clause is to be applied to the Beckenham Urban District Council in respect to their electric light undertaking.

The Gaslight and Coke and Other Gas Companies' Acts Amendment Bill proposes to resolve doubts asserted to have arisen as to the meaning and effect of certain provisions of the Act of 1880. It proposes to amend and incorporate the Act of 1880 into the new Act, more especially as regards appeals of the Gas Companies to the Chief Gas Examiner. These appeals are to be decided in the absence of any party who may fail to attend the hearing, after notice. The report of a Gas Examiner is to be conclusive evidence of a Company's liability to forfeiture for defective supply. Proceedings against the Companies may be taken within six months from the date of the report, or, in the event of a withdrawn appeal, within six months of notice of such withdrawal. Various clauses of the Metropolis Gas Act, 1860, which are repealed by divers of the Companies' Acts, are to be specifically repealed. The Bill is promoted by the London County Council.

The Gomersal Gas Bill is to consolidate the capital of the Company, whose Act was obtained in 1865. The standard dividend is to be 5 per cent. Additional capital to the amount of £20,000 is required. Unsold stock may be offered to consumers or employees of the Company. Borrowing powers are to be increased to one-third of the nominal amount of the consolidated stock. A renewal fund is proposed. The initial price of gas is put at 4s. 6d. per 1000 cubic feet. Discounts are not to be less than 5 nor more than 20 per cent.

The Ryde Gas Bill is to extend the Company's limits of supply to include the whole of the parishes of Binstead and Ashey. The old capital is to be consolidated upon a 5 per cent. basis, with an increase of £50,000, and power to borrow one-third. A renewal fund is proposed. The standard price of gas supplied within a mile of the works is to be 3s. 9d. per 1000 cubic feet, and 4s. beyond. Prepayment meter supplies may be charged 1s. per 1000 cubic feet extra, to cover hire of all fittings. Special supplies may be contracted for.

The Sheppy Gas Bill is to consolidate the capital of the Company into a 5 per cent. ordinary stock, with an addition of £30,000. The borrowing powers are to be increased to one-third of the nominal amount of the stock. A reserve fund is to be formed out of non-divisible profits. Candidates for directorships are to give ten days' notice to the Secretary, to be posted in the office. The Directors may determine the remuneration of the Secretary. Sanction is sought for the supply of power gas by proportional meters, such gas not to contain more than 14 per cent. of carbon monoxide, and to possess a distinctive smell.

The Southend-on-Sea Gas Bill is to extend the limits of supply to numerous parishes, and to authorize the purchase of the gas undertakings at Shoeburyness, Leigh, Rochford, and Rayleigh. Additional 5 per cent. capital to the amount of £300,000 is needed; and new gas lands are to be acquired compulsorily. The borrowing powers are to be increased to one-third. The Directors desire to determine the remuneration of the Secretary. A renewal fund is proposed. The initial prices of gas are to be 4s. 3d. per 1000 cubic feet in the borough of Southend-on-Sea, and 6s. beyond. Discounts up to 10 per cent. are proposed.

The South Shields Gas Bill is to sanction the construction of an embankment and retaining wall on the south shore of the River Tyne, with a jetty, and a railway siding connecting the gas-works with the line of the North-Eastern Railway Company. Additional gas lands are required, to be bought compulsorily within three years. The Company require £300,000 of new 5 per cent. capital, with one-third loan. A renewal fund is proposed. Sanction is sought for the supply of power gas. Gas of 14-candle power is to be supplied, tested with the "London" argand No. 1 burner, or such other as the Board of Trade may from time to prescribe; the gas being burnt so as to yield the maximum light for which the burner is designed. The gas is to be so far free from sulphuretted hydrogen as not to discolour lead test-paper exposed for one minute to a current of gas issuing at the rate of 5 cubic feet per hour. Candidates for directorships must have been qualified for six months, and give to the Secretary ten days' notice of their candidature. The boundary between the Company's district and that of the Newcastle and Gateshead Company is defined. Demands not exceeding £100 are to be recoverable in the County Court.

The Sutton Gas Bill is to consolidate the Company's capital upon a 5 per cent. basis, with the addition of £75,000, and with a loan in the proportion of one-third of the nominal amount of the total issue. A renewal fund is proposed. The initial prices of gas are to be 3s. 6d. and 4s. per 1000 cubic feet; the latter figure being applicable to Banstead and Worcester Park. The prepayment meter excess charge is 10d. per 1000 cubic feet. Discounts up to 25 per cent. are to be allowed.

The Ticehurst and District Water and Gas Bill is to amalgamate the Ticehurst and Robertsbridge Water Company and the Wadhurst, Ticehurst, and District Gas Company. Additional gas lands at Burwash are to be acquired, and the undertaking extended; and further capital to the amount of £10,000 is to be raised, with one-third loan. Preference shares are to be offered by auction or tender.

The Tynemouth Gas Bill is to extend the limits of supply so as to include the civil parish of Earsdon. Additional capital to the amount of £150,000 is needed, bearing a 5 per cent. maximum dividend, and carrying the usual one-third borrowing powers. New gas lands are required. Gas of 14-candle power is to be supplied, tested with a burner yielding its maximum light. Gratis burners are to be furnished to all prepayment consumers, and to others on demand. Special conditions are to rule the price of gas in the new district of Earsdon.

The Whitby Gas Bill is to sanction the acquisition of additional gas lands, and an increase of the capital by £25,000, with the usual borrowing powers. A renewal fund is proposed. The standard price of gas is to be 4s. 6d. per 1000 cubic feet, subject to 20 per cent. maximum discount. Demands under £100 may be recovered in the County Court.

GAS UNDERTAKINGS RETURNS.

THE returns relating to the gas undertakings of the United Kingdom for the year ending Dec. 31, 1902, in the case of the Companies, and March 25, 1903, for the Local Authorities, were issued on Thursday last.

Particulars are furnished this year in regard to 710 gas undertakings, compared with 705 before. The newcomers among the Companies are the Bothwell, Bradford-on-Avon, Bridge of Earn, Chard, Clay Cross, Shepton Mallet, Skegness, South Staffordshire Mond Gas, and Syston and Thurmaston. On the other hand, Abercarn, Airedale, Clayton, Colwyn Bay, Cullingworth, Cwm Avon, Eccleshill, New Swindon, and Poole drop out. The total number of Companies (454) is consequently unaltered. The list of Local Authorities making returns is extended by the addition of Abercarn, Colwyn Bay, Glyncorrwg, Poulton-le-Fylde, and Shoeburyness—raising the total from 251 to 256. The amount of capital authorized for the 710 undertakings (including other purposes than gas supply in certain cases) is £133,574,335, of which £112,867,060 has been paid up and borrowed, including £93,064 by the Mond Company, whose works are stated to be "in course of construction." The total receipts are: Companies, £17,205,092; Local Authorities, £9,554,984—total, £26,760,076.

The statistics relating to working show that 14,109,219 tons of coal were carbonized; the number of cubic feet of gas made being 160,578,787,290, of which 147,732,584,030 cubic feet were sold, inclusive of 16,867,649,442 cubic feet of water gas and 84,287 cubic feet of acetylene gas. The totals in the preceding returns were: Coals, 14,102,629 tons; gas made, 156,686,891,639 cubic feet, of which 144,058,556,176 cubic feet were sold, including 15,365,900,275 cubic feet of water gas and 89,355 cubic feet of acetylene gas. The extended use of water gas is shown by the following figures, included in the totals of the gas sold by the Companies during the past five years; In 1898, it was 5,125,804,000 cubic feet; in 1899,

7,121,198,000 cubic feet; in 1900, 8,945,670,000 cubic feet; in 1901, 11,410,279,000 cubic feet; and in 1902, 12,407,734,000 cubic feet. The figures for the Local Authorities are: In 1898-9, 2,278,390,000 cubic feet; in 1899-1900, 2,955,828,000 cubic feet; in 1900-1, 3,162,782,000 cubic feet; in 1901-2, 3,955,621,000 cubic feet; in 1902-3, 4,459,916,000 cubic feet. Acetylene gas was supplied to the extent of 82,500 cubic feet in the first-named year; it dropped to 75,239 cubic feet in 1899-1900; it afterwards rose to 81,402 and 89,355 cubic feet respectively in the next two years; while in the year 1902-3 it went back to 84,287 cubic feet.

At the date to which the last returns were made up, there were 29,144 miles of mains in use to supply 4,168,725 consumers and 628,136 public lamps. The preceding figures were: Miles of mains, 28,285; consumers, 3,920,992; public lamps, 614,096.

As in previous returns, particulars are furnished regarding the nature and quantity of materials other than coal used for the manufacture of gas, the supply of water gas, and the maximum proportion of its admixture with coal gas. The extent to which oil, petroleum spirit, carburine, or "other material" is being utilized for the production of gas will be seen from the following list of Companies and Local Authorities who make returns:—

Companies.

Alliance and Dublin.	Folkestone.	North Middlesex.
Alton.	Gaslight and Coke.	Norwich (British Co.).
Bath.	Godalming.	Plymouth
Bexhill.	Gosport.	Portsea Island.
Bournemouth.	Gravesend.	Prescot.
Brentford.	Great Marlow.	Preston.
Bridlington.	Great Yarmouth.	Redhill.
Brighton and Hove.	Guildford.	Richmond.
Bristol.	Halesowen.	Rochester.
Canterbury.	Harrow.	Romford.
Caterham.	Hartlepool.	Scarborough.
Chigwell.	Hastings.	Shrewsbury.
Cleethorpes.	Hornsey.	Southampton.
Coatbridge.	Horsham.	Southend.
Colchester.	Hull (British Co.).	South Shields.
Colney Hatch.	Huyton and Roby.	Staines and Egham.
Commercial.	Ilford.	Stretford.
Croydon.	Isle of Thanet.	Swansea.
Crystal Palace.	Kingston-on-Thames.	Swindon.
Dartford.	Lea Bridge.	Taunton.
Derby.	Liverpool.	Tonbridge.
Dorking.	Longwood.	Tottenham.
Dover.	Maidenhead.	Tunbridge Wells.
Durham.	Maidstone.	Tynemouth.
Eastbourne.	Malton.	Waltham Abbey.
Epsom and Ewell.	Mid Kent.	Wandsworth and Putney.
Exeter.	Musselburgh.	Watford.
Falmouth.	Newcastle-upon-Tyne.	West Ham.
Fareham.	Newport (Mon.).	Winchester.
Faversham.	Northfleet.	York.

Local Authorities.

Accrington.	Dunfermline.	Middleton.
Arbroath.	Edinburgh.	Oldbury.
Ashburton.	Glasgow.	Oldham.
Alloa.	Halifax.	Paisley.
Alva.	Hebden Bridge.	Peebles.
Belfast.	Helensburgh.	Perth.
Birkenhead.	Hereford.	Portsoy (acet. gas).
Birmingham.	Heywood.	Ripon.
Blackburn.	Huddersfield.	Rochdale.
Blackpool.	Ilkeston.	St. Helens.
Broughty Ferry.	Keighley.	Smethwick.
Burnley.	Kilsyth.	Southport.
Bury.	Leeds.	Stafford.
Carlisle.	Leicester.	Stockport.
Chorley.	Lincoln.	Stockton-on-Tees.
Coventry.	Llandudno.	Tipton.
Darlington.	Longton.	Todmorden.
Darwen.	Loughborough.	Torquay (St. Mary Ch.)
Dumfries.	Manchester.	West Bromwich.
Dundee.	Middlesbrough.	Wigan.

The new names in the above lists are the Caterham, Fareham, Great Marlow, Huyton and Roby, Ilford, Isle of Thanet, Malton, Newcastle-upon-Tyne, Prescot, and Richmond Gas Companies; and the Local Authorities at Arbroath, Blackpool, Darwen, Dundee, Helensburgh, Heywood, Loughborough, and Torquay. On the other hand, the Brecon, Hoylake, Newport (I.W.), and South Metropolitan Gas Companies, and the Warrington Corporation, drop out. The Gas Commissioners of Portsoy used 10 tons of carbide of calcium in the manufacture of 107,319 cubic feet of acetylene gas, of which 63,679 cubic feet were employed for private, and 20,608 cubic feet for public lighting—together, 84,287 cubic feet, at the price of 6s. per 100 cubic feet.

With regard to carburetted water gas, the returns show that when they were made up it was being supplied by the following Local Authorities and Companies; the maximum proportions of its admixture with coal gas (except where averages are stated) being given in parentheses:—

Local Authorities.

Accrington (20).	Hebden Bridge (15).	Paisley (2·85).
Belfast (about 43).	Leeds (16·5).	Smethwick (not stated).
Birkenhead (33·53*).	Leicester (15).	Southport (av. 11·42).
Birmingham (25).	Lincoln (33·33‡).	Stafford (30·7).
Blackburn (25).	Longton (53).	Stockport (28·32).
Burnley (35).	Loughborough (25).	Stockton-on-Tees (23·63).
Carlisle (20).	Manchester (§).	Todmorden (20).
Coventry (39†).	Middlesbrough (n.s.)	West Bromwich (21).
Edinburgh (11·6).	Oldbury (20).	
Halifax (20·8).	Oldham (36‖).	

* One day only. † On three days only; 28 per cent. maximum proportion for one week. ‡ In the daytime; none at night. § 36·73 per cent. at the Bradford Road station. 19·09 per cent. on the total output. ‖ At one station only.

Companies.

Alliance and Dub. (av. 47).	Gaslight and Coke.*	Portsea Island (31).
Bath (50).	Gosport (20).	Preston (36‡).
Bexhill (not stated).	Guildford (25 to 33⅓).	Redhill (48).
Bournemouth (27·8).	Harrow (45).	Rochester (30).
Brentford (43).	Hartlepool (av. 20).	Romford (30).
Bridlington (33).	Hastings (av. 26·67).	Scarborough (av. 24·13).
Brighton (41).	Hornsey (45, few days).	Southampton (30).
Caterham (n.s.)	Horsham (45).	Southend (35).
Colchester (28).	Hull—British (47).	Staines and Egham (22).
Colney Hatch (31·06).	Ilford (20).	Stretford (37·69).
Commercial (av. 28).	Kingston-on-Thames (24).	Swansea (30).
Croydon (42·7).	Liverpool (50).	Swindon United (35).
Crystal Palace (30·9).	Lea Bridge (nearly 37).	Taunton (37, one day).
Dartford (25·1).	Maidenhead (51·7).	Tonbridge (25).
Dorking (30).	Malton (about 20).	Tottenham (50·19).
Durham (25).	Merthyr Tydfil (25).	Tunbridge Wells (30)
Eastbourne (20 to 30).	Newcastle (av. 4·63†)	Waltham Abbey (n.s.).
Epsom (43).	Newport, Mon. (17).	Wandsworth (3·7 to 27·3).
Falmouth (33·33).	North Middlesex (47·58	Watford (32).
Faversham (25).	Norwich—British (52).	Winchester (30).
Folkestone (40).	Plymouth (41).	York (21·40).

* The Company supplied 4,474,416,000 cubic feet of water gas. Of the total quantity of gas sent out, 14 per cent. was unmixed with water gas. With regard to the remainder, 59 per cent. contained a maximum proportion of 26 per cent. of carburetted water gas, 8 per cent. a maximum proportion of 31 per cent., 13 per cent. a maximum proportion of 33 per cent., 10 per cent. a maximum proportion of 36 per cent., and 10 per cent. a maximum proportion of 39 per cent. † For one week. Minimum average for one week, 2·4 per cent. ‡ Average for one week.

Six new Gas Companies—Caterham, Ilford, Kingston-upon-Thames, Malton, Merthyr Tydfil, and Newcastle-upon-Tyne—appear in the above list. The new Local Authorities furnishing returns are Leeds, Loughborough, and Smethwick.

Comparing the figures furnished by the present returns with those contained in similar returns for the previous nine years, it will be seen that the Companies show as follows:—

Year.	Share and Premium Capital Paid up.	Loan Capital Issued.	Capital Sold under Auction Clauses.	Premiums Realized.
1893. . .	£36,491,562½	£7,544,563	£5,417,667	£2,432,970
1894. . .	37,059,199½	7,739,678	5,715,024	2,637,019
1895. . .	37,307,330½	7,888,086	5,974,455	2,779,604
1896. . .	41,433,325	8,185,710	6,783,468	3,512,818
1897. . .	42,368,976	8,891,218	7,248,545	3,405,345
1898. . .	44,134,488	9,360,293	7,786,216	3,995,781
1899. . .	57,937,016	11,451,134	10,031,384	4,301,820
1900. . .	59,638,877	11,775,642	11,030,474	4,867,124
1901. . .	62,775,845	12,201,533	11,815,348	4,701,958
1902. . .	64,299,112	12,829,925	12,902,864	5,238,898

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1893. . .	6,995,125	71,050,955,154	1,225,253	296,910
1894. . .	7,128,126	72,610,842,498	1,266,943	295,787
1895. . .	7,531,131	77,245,618,489	1,339,712	302,015
1896. . .	7,681,770	80,015,323,004	1,439,272	308,180
1897. . .	7,963,465	84,040,175,901	1,549,627	314,451
1898. . .	7,958,669	86,705,722,752	1,670,847	319,007
1899. . .	8,321,187	91,794,898,282	1,817,649	324,166
1900. . .	8,426,853	94,869,749,232	1,945,825	326,813
1901. . .	8,580,365	97,386,618,553	2,048,359	326,209
1902. . .	8,520,004	99,676,048,000*	2,197,987	333,308

* Number of cubic feet sold, 91,956,324,000, including 12,407,734,000 cubic feet of water gas.

The somewhat similar figures for the Local Authorities are—

Year.	Amount Borrowed, including Annuities (not deducting Repayments).	Receipts.	Expenditure (exclusive of Amount in the next Column).	Interest, &c., Paid.*	Net Profit after Payment of Items in preceding Column.
1893-94 .	£23,619,082	£6,219,460	£4,866,486	£1,038,462	£341,470
1894-95 .	24,624,554	6,402,046	4,681,035	1,114,014	622,366
1895-96 .	25,624,326	6,478,191	4,881,944	1,126,170	493,886
1896-97 .	26,561,689	6,639,342	4,989,283	1,136,789	534,390
1897-98 .	27,376,324	6,759,883	5,058,705	1,161,171	554,014
1898-99 .	28,614,971	7,177,670	5,365,995	1,219,771	625,780
1899-00 .	29,658,730	8,048,089	6,155,725	1,280,168	663,189
1900-01 .	31,509,701	9,121,418	7,463,693	1,353,259	409,802
1901-02 .	34,045,442	9,300,567	7,630,856	1,467,232	414,091
1902-03 .	35,738,023	9,554,984	7,215,502	1,584,985	793,764

* These figures include: (1) Interest paid on loans; (2) amount paid for annuities; (3) amount of loans repaid; (4) amount paid for redemption of annuities; (5) amount placed to sinking fund.

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1893-94. .	4,025,167	39,730,833,247	1,226,332	210,316
1894-95. .	4,191,175	41,684,838,142	1,257,274	217,069
1895-96. .	4,406,315	44,176,134,202	1,320,059	224,873
1896-97. .	4,614,969	47,026,280,408	1,406,456	232,464
1897-98. .	4,652,688	48,652,558,526	1,475,749	239,352
1898-99. .	4,883,148	51,441,272,030	1,578,291	247,857
1899-00. .	5,289,501	55,360,659,139	1,667,908	257,040
1900-01. .	5,479,435	57,138,062,255	1,767,464	278,343
1901-02. .	5,522,264	59,300,273,086	1,872,633	287,887
1902-03. .	5,589,215	60,902,739,000*	1,970,738	294,828

* Number of cubic feet consumed, 55,776,260,000, including 4,459,916,000 cubic feet of water gas and 84,287 cubic feet of acetylene gas.

THE COMING OF THE VERTICAL RETORT.

A Visit to the Settle-Padfield Experimental Installation at Exeter.

It is dangerous, says the sage, to prophesy; but will it be said that we are running into that particular danger by a mere statement of satisfaction that the vertical retort is to-day something more than a dream? It is a reality, producing, under the Settle-Padfield system, results that have caused astonishment, and that—it is only the way of human nature—produce the desire, on the part of those who, from wont, cannot fancy retorts placed otherwise than horizontally, to search round about the system for disadvantages which will counterbalance, or render nugatory, the advantages. Gas engineers and managers cannot, of course, be expected to sit with their mouths open and at once swallow every new thing that comes before them, however brilliant the promise; but an increased make of from 2000 to 3000 cubic feet of decent gas from a ton of Somerset or other slack, without considering attendant beneficial points, will require a good deal of wiping out by any counteractive influences that may be discovered. Many engineers and chemists have visited Exeter since the first publication of precise information as to the result of the working of the experimental retort there; and they have all come away convinced that there is "something in it." Still there are "buts" which cannot be altogether comfortably composed in some of their minds; and it will be one of the objects of this article to place the *pros* and *cons* in two or three of these particulars before readers without, let it be marked, pinning ourselves, for the present, either to one side or the other of the arguments. But so far as concrete facts in regard to working are obtainable, these, alone, are highly favourable to the vertical system, as represented by the Settle-Padfield form of retort and methods of operation. There is in this particular system the advance which justifies the statement that the vertical retort has passed from the dream state into the practical. If further evidence were wanted that men in high position recognize that observable progress has been effected, it is to be found in the adoption of a project for a substantial trial installation of the German type of retort at the Mariendorf (Berlin) works, and in the fact that there is another installation of a fairly large character on yet a third system which will be constructed in this country as soon as the necessary plans and arrangements are matured.

However, it is to the Settle-Padfield system that attention is to be confined in this article; and, as a matter of fact, that is the only one about which any working experiences have been, and are, available for publication. It was in the "Journal" for June 23 last that a report was published which had been prepared by Mr. Norton H. Humphrys, giving a description of the experimental retort at Exeter, and some average results from the working. But it has been a matter of considerable interest to take advantage of an opportunity afforded by Mr. Padfield and Mr. Settle to visit the Exeter Gas-Works, and to make an independent inspection of the working of the plant, which, at the same time, enabled the collection of many useful facts and figures.

When inclined retorts were introduced to this country, the first one was erected for trial in nothing better than an old Scotch kiln at the Brentford Gas Company's works at Southall. The first vertical retort on the Settle-Padfield system, it is seen, found a place in a somewhat cramped corner of one of the buildings on the Exeter works, and the only things about the position to commend it is that it has enabled a perfect independence of test of long duration, without interfering with any of the other operations of the works, and a drive was readily secured for the operation of the feeding plunger from the fitting-shop. If this retort is destined to be the forerunner of a host of others on the same system, then the surroundings of the place of its origin, and its own organic structure, can only be described as most humble. But it is one of the strangenesses of this world that many—perhaps the majority—of successful men and things have had modest beginnings. There is a good and strong point to be made here. It is that, if such excellent results as have been recorded, and will be recorded in this article, can be obtained from such a crudely arranged experimental retort, how much better even will be, it may be expected, the working with the setting of six which has been constructed in another part of the works in a thorough and complete manner for operation on an ordinary scale? Some gain cannot fail to be made. Here is this experimental retort, with its high yield results, merely constructed out of an old stock of 16-inch circular retorts of the kind used at Exeter some twenty years ago; and what is more it has not been put together in a manner that facilitates its discharge by gravity as will be the case in the new setting. Old circular retorts being the material from which it was made, it follows that a good curve, in accordance with the proposals of the inventors, could not be secured. There is at the top the vertical portion of the retort; and then the discharge end is simply inclined from this—after the style (as Mr. Humphrys very appropriately described it in his report) "of the knee-outlet used as a discharge at the end of a piece of perpendicular rain-water pipe;" this discharge end having an angle of about 30°. As may be imagined, there has been some difficulty in keeping gas-tight a joint of this kind with variations of temperature. There has been another drawback occasionally experienced, and that is that the portion of the charge superincumbent on the part lying just at the junction of the inclined and vertical sections has had the effect, through the sharpness of the joint and the rest provided there, of retarding the discharge. But in the new retorts this will not arise, as they are being built with a good sweeping curve, and slightly tapered, which will permit of free evacuation every time the retort mouthpieces are removed. However, the experimental retort now standing is the second that has been in use; but this one has been almost regularly in operation (excepting during holidays) for two-and-a-half years with scarcely any repair—in fact, little more than the attention needed by the junction of the two parts. The lid to the mouthpiece is likewise of a makeshift character, and is merely kept in position by bolts and nuts.

These remarks hinge on to another point. The curve of the new retorts, and the fact that they gradually expand until their diameter is 5 inches larger at the outlet than at the top, will cause their discharge to be easily accomplished. The experiments with the new retorts, too, have demonstrated this, that with the method peculiar to the Settle-Padfield system of charging the retorts, and with the accelerated emission that the charges will obtain, the long-entertained ideal of continuous carbonization will, it is claimed, in one way have been attained. When a retort is started, it is necessary to put in a stopper in the inclined portion after the manner of the stopper in an inclined retort; but, on the completion of the carbonization of the first charge, the stopper can be removed, the coke allowed to fall out until the beginning of a new charge comes into view, when the attendant will close-to the lid of the mouthpiece, leaving a portion of the spent charge lying, in the stead of the stopper, between the mouthpiece lid and the new charge. This method of working is said to be perfectly feasible, and will be practised in the new setting. If so, then carbonization will proceed without intermission, and with little or no loss of gas through the opening and closing of the mouthpieces. And in the Exeter system there is only one mouthpiece from which gas can escape. The conservation of heat thus also secured has to be added to that gained or saved by the method of feeding the retorts with small doses of coal or slack, instead of with large bulks of cold material. On this account, too, and owing to the system of charging, with the small amount of moisture introduced into the retorts at a time by the few pounds of slack, the working temperature is not required to be as high as in ordinary retort practice. Excepting when experimenting with higher temperatures, Mr. Settle informs us that he has not experienced any stopping of the ascension-pipe. (Some interesting records of ascension-pipe temperatures will be found in the first table.)

Having remarked and gleaned these various points while examining this mono-retort setting from the ground-level, ascent was made to inspect the feeding arrangements. The top of the setting is plated over; and, although a considerable time was spent there, there was not the slightest personal discomfort. While, also, charging was proceeding, there was an entire absence of smoke and flame, which is rather an uncommon experience in retort-houses. The arrangements and method of feeding must be described as ingeniously simple and sure. The mouthpiece is a fixture, and from the top rises a short 6-inch bored cylindrical tube, above which is a fixed hopper with a cone-shaped bottom. Fitting into the short length of tube is a rod, with a fixed cone at the bottom, and an adjustable one at the top—both having their apices pointing inwards. This portion of the feeding device works up and down in the cylinder, and is called the "plunger." The term rather conveys the idea of something operating briskly and almost with violence; but as a matter of fact its motion is smooth, slow, and noiseless. However, above the upper cone the rod extends; and movement is given to it by a worm working in a toothed wheel operated by shafting connected with that in the adjoining fitting-shop. There is an automatic reversing device to secure the up-and-down motion. That is all the mechanism required for the feeding of the retort; and there is no part about it which cannot be renewed for a few shillings. It is clear that it will take a lot of work to wear out any one of these parts. They are all simple and solid. The plunger, for example, in this instance, has been at work fifteen or sixteen months; and there is no sign of wear about it, and, although it was removed direct from the retort for inspection, the bottom cone could not be described as more than warm, while the top one could almost be said to be cool. Some of the engineers who have inspected the plant have been doubtful on the point as to the cylinder getting blocked. It is difficult to imagine how it would get blocked, unless it be with large pieces of coal, and then the strength of the mechanically moved plungers could not fail to crush them. At the same time, it is not advisable to work with large sized coal. Besides this, both cones overlap each other's traverse on the outward and return journey. Then it has been suggested that the bottom cone will get very sticky, and prevent the slack slipping off it. The suggestion does not accord with the experience. The cone when inspected was seen to be perfectly clean; and it appears obvious that, with (say) 6½ lbs. of slack slipping off it every 100 seconds or so, the slack must have a scraping action, and the cone be kept clean. The plungers have been worked for a whole week without intermission; and there has never been the least trouble.

Disposing of these objections by the experience so far gained,

Ascension-Pipe Temperatures taken 6 feet away from Mouthpiece on July 28, 1903.

NOTE.—The abbreviations in the table represent: P. at T., Plunger at top; Ch. in, Charge in; J. B. in, Just before Coal in.

9.30 a.m.	100°F.	Before starting
	112	Small quantity of coal put in
	110	P. at T.
9.33 ,,	184	First 6½-lb. ch. in
	158	Plunger at Top
9.35 ,,	144	J. B. in
	220	Second Ch. in
	200	P. at T.
	190	J. B. in
	244	Third Ch. in
	228	P. at T.
	218	J. B. in
	256	Fourth Ch. in
9.40 ,,	240	P. at T.
	226	J. B. in
	270	Fifth Ch. in
	258	P. at T.
	244	J. B. in
	278	Sixth Ch. in
	264	P. at T.
	240	J. B. in
	272	Seventh Ch. in
	264	P. at T.
	252	J. B. in
9.47 ,,	282	Eighth Ch. in
	274	P. at T.
	266	J. B. in
9.49 ,,	286	Ninth Ch. in
	280	P. at T.
	272	J. B. in
	290	Tenth Ch. in
	270	P. at T.
	270	J. B. in
	290	Eleventh Ch. in
9.54 ,,	288	P. at T.
	282	J. B. in
	288	Twelfth Ch. in
	288	P. at T.
	290	J. B. in
	348	Thirteenth Ch. in
	320	P. at T.
9.56 a.m., 96 lbs. in, stopped charging.		
10.00 ,,	290	
10.15 ,,	272	
10.30 ,,	272	
10.45 a.m.	242°F.	
11.0 ,,	226	
11.15 ,,	250	
11.30 ,,	218	Commencing another 48 lbs.
11.31 ,,	218	J. B. in
	300	First Ch. in
	306	P. at T.
	310	J. B. in
	330	Second Ch. in
	346	P. at T.
	346	J. B. in
	360	Third Ch. in.
11.35 a.m.	274	P. at T.
	400	J. B. in
11.35 ,,	420	Fourth Ch. in
	450	P. at T.
	460	J. B. in
	460	Fifth Ch. in
	450	P. at T.
	450	J. B. in
	460	Sixth Ch. in
	430	P. at T.
	418	J. B. in
	430	Seventh Ch. in
	404	P. at T.
	400	J. B. in
11.44 ,,	410	Eighth Ch. in
11.44 a.m., 48 lbs. Coal in.		
12 noon	320	
12.15 p.m.	276	
12.30 ,,	270	
12.41 ,,	274	Commenced Second 48 lbs.
12.42 ,,	330	First Ch. in
	340	P. at T.
	336	J. B. in
	358	Second Ch. in
	352	P. at T.
	342	J. B. in
	358	Third Ch. in
	358	P. at T.
	354	J. B. in
	364	Fourth Ch. in
	360	P. at T.
	358	J. B. in
	366	Fifth Ch. in
12.42 p.m.	364°F.	P. at T.
	358	J. B. in
	390	Sixth Ch. in
	386	P. at T.
	380	J. B. in
	396	Seventh Ch. in
	394	P. at T.
	386	J. B. in
12.55 ,,	398	Eighth Ch. in
	400	P. at T.
48 lbs. Coal in.		
1.0 ,,	390	
1.15 ,,	320	
1.30 ,,	300	
2 0 ,,	288	
2.15 ,,	280	
2.26 ,,	264	Commenced 32 lbs.
2.27 ,,	344	First Ch. in.
	354	P. at T.
	348	J. B. in
2.30 ,,	398	Second Ch. in
	392	P. at T.
	384	J. B. in
	410	Third Ch. in
	398	P. at T.
	376	J. B. in
	388	Fourth Ch. in
	378	P. at T.
2.35 ,,	410	Fifth Ch. in
	410	P. at T.
	404	J. B. in
	434	Sixth Ch. in
	428	P. at T.
2.39 ,,	434	Seventh Ch. in
32 lbs. Coal in.		
2.45 ,,	344	
3.0 ,,	304	
3.15 ,,	284	
3.30 ,,	248	
3.45 ,,	240	
4.0 ,,	238	
4.30 ,,	220	

A second Thermometer, fixed 25 feet away from the first one, and 11 feet on outlet side of hydraulic main, varied as follows:—

Time.	1st.	2nd.	Time.	1st.	2nd.	Time.	1st.	2nd.
9.40 . . .	242 ..	110	1 p.m. . . .	390 ..	150	3.00	304 ..	130
	226 ..	114	1.15	320 ..	137	3.15	284 ..	128
	250 ..	135	1.30	300 ..	130	3.30	248 ..	125
12 noon . . .	320 ..	155	2.00	288 ..	128	3.45	240 ..	125
12.15 . . .	276 ..	135	2.15	280 ..	128	4.00	238 ..	123
12.30 . . .	270 ..	130	2.26	264 ..	128	4.15	272 ..	158
12.41 . . .	274 ..	128	2.45	344 ..	138	4.30	220 ..	150

in order to make this article complete, brief reference may be made (although described before) to the charging itself. As has been already shown, the charge is fed into the retort in small quantities—at the time of the visit, in the already mentioned 6½-lb. doses. These small charges are the foundation of the system; and to them must be ascribed, in the main, the large yield of gas per ton from the class of slack used. The slack is fed into the conical bottomed hopper—in the case of the experimental retort by hand; in the permanent installation, from overhead hoppers, with shoots which will be self-sealing in the conical hopper. As soon as the mechanism is set in motion, the plunger rises; and as the top cone ascends above its seat, the coal drops into the annular space formed by the rod and outer cylinder. On the reversing of the motion, causing the descent of the plunger, as soon as the lower cone passes the outlet of the cylinder, the slack slips into the retort; and the cone directs it outwards towards the incandescent sides, building the charge up gradually layer by layer with a depression in the centre. The experimental installation is fitted complete with a test plant, right away to the holder; and, stepping outside to the meter, it is very curious to observe how rapidly the large pointer revolves with the dropping of each contribution to the charge in the retort, and how it slows down again while the plunger is repeating its operation. This is striking evidence of the rapid evolution of the gas and its escape from the ordinary baking and deteriorating influence of heat—thus producing a uniformity of quality through this system of carbonization in small doses. [More detailed descriptions of the invention will be found in the "JOURNAL" for June 16 and 23 of last year.]

Now, the tests that have been carried out, as previously said, have been of long duration, and most carefully and completely made—a temporary laboratory having been erected just outside the house, and fitted with all necessary apparatus for photometric, calorific, and other examinations. Some of the results have already been published; and Mr. Settle gives the information that from the Somerset and Durham slacks, it is possible [see tables, p. 82] to get a yield up to 13,000 cubic feet, as against, with the ordinary horizontal working, just a trifle over 10,000 cubic feet. Some eleven different classes of slack have been tried in the retort; and with equally good results—with Yorkshire slack, the result has been even better than that referred to. The system, it is seen, lends itself especially to the obtaining of the highest results procurable from small, poor, and cheap varieties of coal. But apart from the quantity and quality of the gas, the large hard coke that is yielded is a feature of great importance. The same slack in the horizontal retorts produces 25 to 30 per cent. less gas and a very indifferent coke, which is difficult of sale. In fact, were it not for the sulphur in the coke, it would be perfectly suitable for foundry purposes, so hard is it.

Before passing from the experimental retort to other matters, there is another point as to the tar. As was stated in Mr. Humphrys' report, the high gas results are partly realized at the expense of the tar. It is reduced certainly to half what is obtainable in ordinary work, or about 5 gallons per ton of coal. But now in the working of the system the inventors have arranged to get rid of even this 5 gallons by putting into the gas its illuminating constituents. Away from June 26 last, they have had no tar to reckon with so far as this retort is concerned. It is accomplished by an ingenious arrangement invented by Mr. Settle, upon which he has been at work for some years, and was doing so even at the time Professor Lewes was speaking on the subject in May, 1900,* before the Institution of Gas Engineers.

Some extensive experiments have been made, and the resulting figures collected comparatively into tabular form, showing among other things how the quality and quantity of the gas are maintained hour by hour in the Settle-Padfield system, and the variations that occur in these respects in the ordinary retort-house process. The figures are advanced as proof that the gas and illuminating power are in the coal, and are obtainable if the carbonization is conducted, as the inventors put it, in "the proper way." The figures (which will be found on p. 82) will bear a considerable amount of study.

A few words as to the new bed of six retorts that has been constructed at one end of one of the old horizontal retort-houses. It is very complete and compact, and contains six circular retorts (three on either side), of 1 ft. 4 in. top diameter, expanding to 1 ft. 9 in. at the bottom. The vertical portion of the retort, which is in one length, is 3 ft. 6 in. long, and the inside measurement of the curved and inclined discharge end (formed of four segmental ring-pieces) is 4 ft. 9 in.—making the length

*See "JOURNAL," Vol. LXXV., p. 1198.

Losing Sperm Value.

Class of Coal.	Weight of Charge. Lbs.	Highest Candle Power during First Hour.	Average Candle Power for Six Hours.	Difference between Highest and Average.	Loss of Candle Power by Passing Gas through Hot Coke.		
					Candle Power before Passing through.	After Passing through.	Loss in Candle Power.
Cannel	448	27·50	20·60	6·80	14·25	11·25	3·00
,,	168	26·50	21·40	5·10	13·75	9·25	4·50
,,	224	26·00	10·10	6·90	13·75	9·00	4·75
,,	224	26·00	21·50	4·50	14·25	8·75	5·50
,,	168	29·50	25·50	6·00	14·50	8·75	5·75
Coal	224	16·00	14·10	1·90	13·50	9·50	4·00
,,	168	15·50	12·00	3·50		Average.	
,,	168	18·00	15·75	2·25	—	—	—
Nuts	224	20·50	17·40	3·10	14·00	9·41	4·59
,,	448	20·00	17·00	3·00	—	—	—
,,	168	19·00	16·00	3·00	—	—	—
,,	168	22·75	18·50	2·25	—	—	—

Note.—The candle powers in cannels ran through six hours. Coal = 4½ hours. Nuts = 6 hours. Coal after 4½ hours below 12 candles.

All readings under 12 candles were not recorded, so that loss in average was more in the tests of coal and nuts.

MARTIN PRIEST, A.I.C., F.C.S., Gas Examiner to the London County Council.

Loss of Candle Power by Passing Gas through Hot Coke.		
Before.	After.	Loss.
14·25	10·00	4·25
14·25	10·00	4·25
14·50	10·25	4·25
14·50	10·00	4·50
15·00	10·25	4·75
15·00	10·50	4·50
15·50	11·25	4·25
—	—	—
20·00	15·75	4·25
19·50	14·25	5·25
19·00	14·25	4·75
16·75	12·75	4·00
15·50	11·50	4·00
	Average.	
16·44	11·73	4·71

T. SETTLE, Exeter.

Settle-Padfield Process.

Finding Sperm Value.

Name of Slack Coal.	Number of Readings.	Time under Test.	Candle Power. Average.
		H. M.	
Newbury	9	1.25	20·02
,,	8	3.40	20·20
,,	11	4.10	20·20
,,	9	4.45	20·75
,,	16	6.15	20·75
,,	14	5.50	20·30
Hebburn	26	1.45	19·90
,,	12	7.00	20·44
,,	12	7.00	20·64
,,	10	3.20	20·12
Silkstone	19	9.15	21·34
Clay Cross	8	3.30	20·16
,,	12	6.00	20·25
South Pelton	13	9.30	20·45
West Leverson	19	7.45	18·89
Arley	22	5.42	19·52
Camerton	16	9.00	20·18
Clutton	4	3.00	21·37

Note. — Readings taken with Harcourt's Pentane Photometer and Sugg's Illuminating Power Meter.
Tests made by MARTIN PRIEST and T. SETTLE.

Settle-Padfield Process.

Maintaining Sperm Value.

1903. Week Ending	Name of Slack Coal.	No. of Tests. 2 Cwt.	Gas. Cubic Feet.	Average Candle Power.	Coke Produced. Lbs.	Tar.
		Each.				
July 4	Hebburn	10	13,358	13·80	1620	None.
,, 11	Newbury	10	13,265	13·60	1630	,,
,, 18	West Leverson	10	13,570	13·50	1620	,,
,, 25	Camerton	10	13,282	13·60	1610	,,
Aug. 1	Waldegrave	10	13,375	13·80	1602	,,
,, 8	South Pelton	10	13,192	13·70	1633	,,
Sep. 5	Radstock	10	13,260	13·64	1606	,,
,, 12	Pelton	10	13,191	13·38	1626	,,
,, 19	Camerton	10	13,190	14·65	1596	,,
,, 26	Strafford	10	13,170	14·97	1606	,,
Oct. 2	Mirfield	10	13,100	14·96	1604	,,

Average of 110 Tests of 2 cwt. each—Gas, 13,189 Cubic Feet per Ton; Candle Power, 14·56.

Ordinary Retort-House Process.

Carbonizing Results.

Coal.	Tons.	Gas, C. Ft.	Coke, Lbs.	Candle Power.
Hebburn	46	10,537	1570	14·33
Newbury	73	10,135	1554	14·30
Leverson	54	10,156	1648	14·54
Camerton	52	10,160	1546	15·25
South Pelton	27	9,577	1677	14·00
Clay Cross	25	10,158	1507	14·70

Irregular Rate of Quantity and Quality.

Based on 2 cwt. Charges.

—	Newbigging.	Herring.	O'Connor.	O'Connor.	Blair Recent Test.	
Hours.	C. Ft.	C. Ft.	C. Ft.	C. Ft.	C. Ft.	Candle Power.
1st	520	332	512	564	640	45
2nd	340	294	301	368	500	40
3rd	120	266	176	130	300	35
4th	35	104	80	37	60	35
5th	—		30		(See "JOURNAL," Sept. 15, 1903, p. 674.	
6th						
6½						
—						
7th					Difference between first and fourth hour 10 candles.)	

Note.—The quantity appearing against the seventh hour in most cases is the rate per hour based on the make for periods of time within the hour according to the time the test was stopped. All quantities up to and including the sixth hour are actual quantities obtained.

Settle-Padfield Process.

Regular Rate of Quantity and Quality.

Averages of 110 Tests of 2 cwt. each.

C. Ft.	Candle Power.
246	14·99
216	15·00
207	15·13
201	15·05
201	15·10
177	12·99
150	12·00
Average.	
Per Ton. 13·189	C. Power. 14·56

throughout 8 ft. 3 in. The furnace is on one side of the bed only. The coal is to be elevated to overhead hoppers; and these will feed into the conical hoppers for the supply of the plungers through shoots which will be sealed by the coal in the latter. In every respect, the working will be as already described in dealing with the experimental retort. But all the crudity that is present in the latter has been banished; and there is an air of completeness, excellence, and permanence about the whole of the work. It is from the experience with this setting that the perfecting of the structural details will be accomplished. The house in which the bed stands is 55 ft. 4 in. wide; and at the other end there is an old horizontal bench of 20 feet retorts. Now in the place of one central bench, it would be possible to get into the house two benches of vertical retorts of six in a bed—each bed being 10 ft. 9 in. by 8 ft. 6 in. centres. The reason that two benches would be possible is simply due to the fact that no large amount of room is required as ordinarily for the charging and drawing operations—the former being done mechanically on the top of the bench, and the latter by gravitation. The 55 ft. 4 in. wide house would be divided in this way: Two benches 10 ft. 9 in. each, a centre space of 13 ft. 10 in., and a space between the benches and each side wall 10 feet wide. With two retort-benches arranged in this way, it might be possible to work both benches from a single continuous hopper running overhead between them with shoots leading on either side to the whole of the conical feeding hoppers. This would mean, in addition, that one elevator and one overhead conveyor would suffice.

This brings us to one or two other matters of considerable importance, which have been advanced as likely to be to the disadvantage of the vertical system from an economical aspect. The first is as to the comparative amount of ground space occupied for a given unit of production. It is held by some that the vertical retort would come out second best in this regard. In connection with the Settle-Padfield system, the matter has been investigated; and what follows are from calculations made by gas engineers

in connection with horizontal retorts, and by Mr. Settle for the vertical retorts. In the former case, the basis taken was ten settings of eight 20-feet retorts; and for these 118 ft. 6 in. are allowed. If ordinary stoking machinery is employed for charging and discharging, 12 feet are added on at each end of the house. This gives a house 142 ft. 6 in. long, and 70 feet wide. The size adopted for the retorts is 22 in. by 16 in. ⏛, in which the proposition is that 3 cwt. of coal would be carbonized per 10-feet length. Now this gives 9975 superficial feet of floor area. Allowing that the ten beds of eight horizontal retorts would carbonize 96 tons per twenty-four hours, this is 103 superficial feet of floor area per ton of coal carbonized; and, at the rate of 10,300 cubic feet of gas per ton, the production is 99 cubic feet per square foot of floor area. Coming to the cubical capacity of the ten beds, which are 118 ft. 6 in. long by 20 ft. by 11 ft. high, it is found that in the whole bench there are 26,070 cubic feet of brickwork—that is, 272 cubic feet per ton of coal carbonized. At 96 tons, the producing power is 37·8 cubic feet of gas per cubic foot of brickwork in the bench. In the ten settings, there are 1600 feet run of retort—that is, 16·6 feet run of retort per ton of coal carbonized, or 618 cubic feet of gas per foot run of retort per twenty-four hours. In retorts 22 in. by 16 in. by 20 ft., the carbonizing capacity is 20·32 cubic feet per 10-feet length. Ten beds of eights would equal 3251 cubic feet of carbonizing capacity, which is equivalent to 33·8 cubic feet of retort capacity per ton of coal carbonized per twenty-four hours. The producing capacity from this would be 304 cubic feet of gas per cubic foot of retort per twenty-four hours.

Now on the experience gained at Exeter with the experimental retort, comparative figures have been calculated. First of all, a floor area of 142 ft. 6 in. by 60 ft. is taken, which gives 8550 superficial feet, or 79 superficial feet of floor area per ton of coal carbonized. [Here only 15 cwt. of coal per twenty-four hours are taken for the vertical retorts, which is rather doing them an injustice. It will be obvious that in a vertical retort of the capacity given, using slack, every available cubic inch of space could be occupied, so that the weight possible would be above 6 cwt.] Per foot of retort-house area, 161 cubic feet of gas are produced. A house of these dimensions would contain 24 beds of six vertical retorts, which would comprise 14,907 cubic feet of brickwork, or 138 cubic feet of brickwork per ton of coal carbonized, or 92 cubic feet of gas per cubic foot of brickwork. The 24 settings of sixes would contain 1188 feet run of retort, equal to 11 feet run of retort per ton of coal carbonized, or 1162 cubic feet of gas per foot run. Here is, according to the calculation, nearly 100 per cent. advantage at once, as the computation for the horizontals is 618 cubic feet of gas per foot run.

Comparing the figures, we find that each vertical retort has a carbonizing capacity of 14·6 cubic feet, against 20·32 cubic feet for the horizontals; 19 cubic feet of retort per ton of coal carbonized, as against 33·8 cubic feet; and a production of 661 cubic feet of gas per cubic foot of retort, against 304 cubic feet. These various figures brought into comparison from different sources will be of exceptional interest, as from the revival of this subject of carbonization by a system of vertical retorts, the question of ground space occupied per unit of gas production has been one of much comment and inquiry. The information published here may assist to set at rest a very important matter, which is all too readily assumed to be to the disadvantage of the system.

Then another point upon which engineers are heard to pass criticism is the subject of capital cost. That is a matter which must at present be referred to with some reserve, as nothing more than a single bed of sixes has so far been constructed. It is, however, estimated at Exeter that the capital cost will be considerably less than for ordinary retort-settings—more particularly when the cost of stoking machinery for horizontals is taken into the calculation.

Then the fuel account is regarded as a vital point; and it has been thought that this will be rather high. This is another matter about which there must be actual experience before anything decisive can be said. But looking back at the comparison just made, we find figures there which have some bearing upon the question, as it must follow that the less material there is to be heated up for a given gas production, the lower must be the quantity of fuel required. Reference to the figures will show that with the Settle-Padfield system as compared with the horizontal, there are 1425 superficial feet less floor area; 24 superficial feet less floor area per ton of coal carbonized; 62 cubic feet more gas produced per foot of floor area; 11,163 cubic feet less brickwork in the two ranges of benches—only 138 cubic feet of brickwork per ton of coal carbonized; while 55 cubic feet more gas per cubic foot of brickwork are realized. Then there are 412 feet run of retort less, and 5·6 feet run of retort less per ton of coal carbonized, with 544 cubic feet more gas produced per foot run of retort. In all, the retort capacity is 1163 cubic feet less, or 14·8 cubic feet less per ton of coal carbonized; while the yield of gas is increased by 357 cubic feet per cubic foot of retort capacity. Beyond this calculation of the smaller amount of material requiring to be heated, there is the question of the lower temperatures which suffice with this system of charging the coal into the retorts in quantities about equalling in the number of pounds the hundredweights commonly charged into a 20-feet horizontal retort. With the latter, it goes without saying that the heat must be sufficient to penetrate to the centre of the mass of coal in a given time, and to heat up the excess brickwork which the Exeter calculations show. These are some of the arguments which are heard at Exeter, and which, even if they are not sufficiently cogent for all who hold doubt on these points, may assist in turning their thoughts into channels which will help them to a determination.

We have dealt with a few matters in this article all of which are of more or less importance in connection with the general question of vertical retorts and their method of operation. The system which has been particularly under notice is one which requires a minimum of machinery and labour, and (even in the experimental retort) has furnished maximum results. All that is good about the system, and much of what may be raised in its disfavour, have been mentioned here; and it clearly appears to us that, when the process in a few weeks faces ordinary working, it will be found that the good will be in the ascendant, and that the unfavourable criticism on points outside the working will be a declining quantity. The experimental working alone has given the assurance of an immense saving being effected by the system, through the use of small coal or slack as against the ordinary large gas coal—a higher yield of gas being obtained from even a slack which is designated as "muck" carbonized in the Settle-Padfield vertical retort than is obtained from best coal by the ordinary process; while the coke also produced with the vertical retort from the slack is far larger and harder, and consequently more valuable, than that realized from the coal in usual working.

ELECTRIC LIGHTING MEMORANDA.

Electric Lighting Affairs at Maidstone—Electric Heaters—Their Inefficiency—Electric Supply Charges—Mr. E. H. Crapper's Views—The Latest Marylebone Development.

The affairs and prospects of the Maidstone Corporation electricity supply undertaking naturally constitute one of the most pressing cares of the people and the authorities of the town, which enjoys the services of one of the best-administered of gas companies. Still, of course, the ratepayers were not happy until they had electric light of their own; and this has now been their fortune for two years. The most salient result of the working of the undertaking (upon which £45,242 has been expended) is a deficit in the latest accounts, which cover the first fifteen months' working, of £3163 chargeable to the district rate. This is not so very dreadful for a start; but the Electricity Committee evidently do not admire the prospect for the future. Accordingly, they have devised a scheme of prices for current which, if they were dealing with their private business, one might applaud as liberal. Seeing that it is the property of the town that is in question, however, the aspect of the proposal is different. Briefly, all current not required between the hours of dusk and eight o'clock during the winter months is to be priced at 1d. per unit, provided the consumer pays £1 a year for a time-switch. Motors are already supplied at 1d. per unit, and henceforward users of 50-horse power are to charged any price they will pay. This is a bright look-out for the ratepayers. The works cost of the unit is 1·73d. The future development of this business will be watched with interest. The undertaking has scarcely felt its feet yet; but already the burden of loan repayment is 5½ per cent., which is not to be borne by giving away current at half price.

During last year desperate attempts were made by many electricity supplying undertakings to work up a business for the winter in electric heaters. It would be interesting to know how many of those patrons of company or corporation electricity who were persuaded into taking an electric heater are disposed to continue its use after the recent "cold snap," slight as this was. An electric heater, so called, is all very well, provided the weather is not really cold, and provided also that the user does not mind paying handsomely for the fancy. They are not cheap things to buy or set up; and few companies are prepared to incur the whole expense attaching to hiring them out. That is to say, the companies may offer to lend the heaters, but require the user to pay for fitting and connecting them, besides signing an agreement to retain and pay for the hire for a considerable period. It is only municipal dealers in electricity who can afford to scatter these very expensive articles broadcast, paying all outgoings. They usually come back into store before very long. The truth of the matter is, of course, that of all extravagant methods of obtaining heat, the use of a so-called electrical heater is far and away the dearest. It cannot be otherwise, seeing how it is done. Makers of these appliances may puff their wares, and disparage those of their rivals; but the facts cannot be gainsaid; and they are, commercially speaking, hopeless.

Electric heating means the employment of resistances so as to obstruct the current, and thereby signalize the absorption of energy by the rise of temperature. Every unit of electricity will produce a certain quantity of heat in this way, and always the same amount. No artfulness in designing resistances can have the effect of making them give off more heat than the unit of electricity contains potentially; and this is very little. Not 5 per cent. of the total heat value of the coal burnt to generate the unit can be recovered as sensible heat from an imperfect conductor; so the utter wastefulness of this use of fuel is very apparent. It would amount to an economic and industrial sin, if it were not that the consumer who is asked to be an accomplice in the act knows better than to pay from 3d. upwards for 5 per cent. of the

heat which originally cost the electricians a halfpenny. Strange "science," this! It appears tolerably clear, on reflection, that electric heating is likely to remain one of those phenomena of the distribution of strong currents which will never be directly productive of profit. That is to say, it will figure chiefly among those entries of electricity stated to be "utilized on distribution"—meaning wasted; and this in some cases amounts to one-third of the whole quantity generated. More "science!"

Managers of central electricity supply stations continue to be greatly exercised over the multiform methods of charging for energy. Notwithstanding the reputed success of several systems of making out bills for consumers on the great principle of persuading the public that electricity is cheap, those who have to foot these bills contumaciously persist in regarding them as being high. The latest disquisition on this fruitful topic that has received the applause of the electrical world is the production of Mr. E. H. Crapper, and was submitted to the Leeds Section of the Institution of Electrical Engineers. The difficulty of "making the punishment fit the crime" in the matter of charging for electricity consumed for lighting, is inherent in the peculiar nature of the trade. This is a matter of which the ordinary business man is ignorant. This commercial person has usually been brought up on one theory of business dealing, which the theorist distinguishes as the law of increasing returns. In popular language, it means that the purchaser can generally obtain "a reduction in the price on taking a quantity" of the commodity. The ordinary business man is not greatly given to rationalizing on his commercial experiences, and he thinks that this particular one is, or should be, of universal applicability. It comes with quite a shock to him to learn that there are commercial transactions to which the rule does not apply. Tell a shopkeeper of the law of diminishing returns in trade, and he can only grasp the fact when it is presented in some concrete examples. These are, as a matter of fact, common enough. But a greater difficulty arises when people are required to acquiesce in a system of charging for services rendered, with admission of a time-factor.

Yet it ought not to be impossible to convince a shopkeeper that the hire (say) of a messenger for a whole day will cost less per hour than if he is only wanted for one hour, and that at a time when everybody else is clamouring for his services. Assuming this to be done, however, the consequent difficulty arises of making a fair appropriation of the stand-by and service charges, capable of being "understanded of the people." Doubtless, the just way would be to simply adopt Dr. Hopkinson's plan, and charge consumers so much per lamp for being ready, with the addition of a fixed price for current actually consumed. We do not know, however, of a single example of this in practice—doubtless owing to the fact that those possible consumers who ought to pay the most under this head (such as large millowners), would refuse to do so. In certain manufacturing towns, it is true, the knot of this difficulty is cut by the refusal of the electric lighting authority to connect up such customers at all. Mr. Crapper appears to admit that when this class of consumption does not trouble the suppliers of electric light, they still have the greatest obstacles to increased and more profitable trade to contend with, in incandescent gas light and the costliness of house wiring. After all is said and done, the electricians cannot get over the public knowledge that the incandescent gas-burner is both brighter and cheaper than the incandescent electric lamp. As the "Electrical Review," quoting Mr. Crapper, puts it, "the efficiencies of the electric glow lamp and the radiator are low compared with the incandescent mantle and gas-stove respectively." It has taken a long time to get this cardinal truth accepted and publicly confessed by electricians; but the day has come at last. Cheaper wiring and something very much better in the way of lamps are needed in order to pull the electric light industry round. Mr. Crapper believes that "the sooner the growth of the electric light business is such as to affect the supply of gas, the sooner will the question of charging settle itself." This is as much as to say that when a man's fortune is made he will know how he ought to carry on his business. Quite so; but the demonstration should not be delayed to such an advanced period, if it is to be of much use.

The Committee of the Marylebone Borough Council appointed to interview the Directors of the Metropolitan Electric Supply Company, in order to ascertain the terms on which the Company would agree to set aside the arbitration award, have reported to the Council. The mission has practically failed to move the Company from their position; the utmost the Directors are prepared to concede being the acceptance of borough stock of the amount of the award, bearing interest at an agreed rate. Then the Company would take a lease of the undertaking, at a rent equivalent to the yearly interest on the stock, which would be redeemed at par in 42 years. The Company would pay, on the same basis, interest on the capital which the Council are liable to provide for expenditure from Jan. 1, 1902, to the commencement of the lease. At the end of the period of 42 years, the Company would sell to the Council so much of the Willesden generating plant as might be required for their severed portion of the undertaking. There is also a verbal promise that if the leased property should become more profitable as the years go on, a proportion of these extra profits shall be given to the Council. It is an ingenious exercise in the higher industrial finance; but the Council do not seem to appreciate the performance, and have decided to hold a special meeting to receive a report of the Electricity Committee on the scheme.

PERSONAL.

It will be seen by an announcement which appears elsewhere, that the position of Gas Engineer and Manager to the Southport Corporation will shortly be vacant. This results from the retirement of Mr. JOHN BOOTH in May next, when he will have completed 25 years' service, and about 45 years' connection with the gas industry. Mr. Booth entered the office of the Secretary of the Stalybridge Gas Company as junior clerk in 1858; and upon the Secretary's death he went to the gas-works as Clerk and Manager's Assistant. On the death of the Managing Director, he was appointed Manager, and was with the Company for about twelve years. During this time complete new gas-works were erected by the Company at Mossley—a distance of about four miles from Stalybridge; Mossley, Saddleworth, and the district being then in the Company's area of supply. These works were completed and commenced making gas during Mr. Booth's management. In 1872 he obtained the appointment of Gas Engineer to the Middlesbrough Corporation, and held it for seven years, during which time extensive alterations and additions had to be made to the plant to meet the very large increase in the demand for gas, this being an exceptional period for the iron trade. In 1879 he removed to Southport. On arriving there he found a new site about two miles from the town had been bought, upon which to erect works, so as to allow of the closing of those in the town. A small quantity of plant had already been erected there, and the manufacture of gas was going on; but additions had to be continually made to keep pace with the growth of the town and the increasing demand for gas, and enlargements of all the works mains had to be carried out. Considerable additions to the retort power have also been made; new washers, condensers, exhausters, station meter, and governors (one 30-inch and another 20-inch) have been installed; and two new purifiers each 20 feet square, and four others each 38 ft. by 24 ft. erected. Plant for the production of oil gas by the Peebles process, and also for making carburetted water gas, has been installed, sulphate of ammonia apparatus put up, and West's stoking machinery and coke-handling plant introduced. The whole of the engineering work during Mr. Booth's tenure of the position he will shortly relinquish has been done by him; and the effect of his management is evidenced by the progress of the undertaking, particulars in regard to which will be found in another column.

The Victoria Hotel, Wolverton, was last Saturday week the scene of a very interesting function, in the shape of a complimentary dinner and presentation to Mr. ROBERT KING, late Chief Gas Engineer of the Southern Division of the London and North Western Railway. Mr. King has been in the service of the Company for 43 years; and for 35 years he has held the position from which he has just retired. The present to him consisted of a very handsome gold watch bearing the following inscription: "Presented to Robert King, Esq., by friends and employees in the L. and N.W. Railway Company, Gas Department, Wolverton, in memory of 43 years' happy association, 1903." For Mrs. King, there was a handsome gold bracelet set with diamonds and rubies; and for Miss King, a silver mounted dressing case. The Rev. W. L. Harnett, M.A., who presided, in making the presentation, said Mr. King had a good long service to look back to. The dominant note in his career in the Gas Department had, perhaps, been kindliness. No one ever found him a hard taskmaster. He and Mr. King had many things in common. They were not only associated with gas-works, but also in educational and Masonic affairs, and, in a smaller degree, in horticultural matters. Mr. H. FIELD (Mr. King's successor) remarked that he had been intimately associated with Mr. King in his work for somewhere approaching a quarter of a century. The manner in which Mr. King had always presided over the department had been exemplary; and he (the speaker) felt a difficulty in following his lead. It was impossible for him to surpass Mr. King's work; but, with the help of the staff, he hoped to make a good second. Mr. Owen Claridge and Mr. E. Atterbury also spoke to the pleasure they had experienced in working for a very long period under Mr. King; the former pointing out that Mr. King's last act was one of kindness, in recommending a man whom he knew would be acceptable to all of them. Mr. King, in returning thanks for the gifts, said he had occasionally been under difficult circumstances, but never in such a difficult position as he then found himself. They had indeed shown an unexpected and an unusual kindness on this occasion by meeting together in such large numbers as a representative assembly, promoted, he knew, by his colleagues and comrades of the Gas Department, who had been supported by many outside. He was greatly touched by their act of kindness, especially in including the members of his family. In his whole service with the Company and his association with his colleagues and comrades, the keynote was a sense of strict justice. He had always sought to administer matters in connection with those about him in the light that the strength of all discipline lay in its justice. It was not always given to a gas engineer to be absolutely in a position to give entire satisfaction to all consumers; but so far as his opportunities, his plant, and the conditions generally allowed, it had always been his endeavour to give satisfaction in the town, and to the relative consumers. He was quite sure that, in the hands of his successor, Mr. Field, the best traditions of the department would be upheld. Mr. C. Meiklejohn, of Rugby, said that it gave him great pleasure to be

present to do honour to his old friend Mr. King. He had not been associated with Mr. King so long as some; but he could heartily endorse all the good things that had been said of him. He was also able to testify to the high appreciation in which he was held by the Midland Association of Gas Managers, of which he was an esteemed member; and he hoped that, now Mr. King's time was not so fully occupied, the Association might have in a larger measure the benefit of his talent. On all hands admiration was expressed at the arrangements for the gathering made by the Secretary (Mr. Claridge), the Treasurer (Mr. Atterbury), and the other members of the Committee.

OBITUARY.

HERR VON HEFNER-ALTENECK.

A Reuter telegram from Berlin brought to London on Thursday the sad news of the sudden death on that day, as the result of an apoplectic seizure, of Dr. Friedrich von Hefner-Alteneck, whose name will be remembered by most of our readers in connection with the standard of light which bears it. The deceased was born at Aschaffenburg, in Bavaria, on April 27, 1845, and was consequently in his 59th year. In 1851, he went with his parents to Munich, where he attended the Polytechnic School—subsequently studying in the similar educational establishment at Zurich. As a youth he displayed a decided inclination for the study of natural science, and great skill in the production of mechanical appliances. In 1867, after a visit to the Paris Exhibition, he determined on commencing practical work. On returning to Berlin, he was admitted, in a quite subordinate capacity, into the establishment of Messrs. Siemens and Halske. But he was soon removed from the shops to the engineering department, of which he was eventually entrusted with the control. In this capacity he originated many of the inventions which have emanated from the firm; the best known of them relating to electric lighting. Notwithstanding the success of the Jablochkoff "candles" when they were first employed for public lighting in Paris in 1877, Herr von Hefner-Alteneck was of opinion that it could not last, and that the future of this system of illumination depended upon the improvement of the old carbon light regulators. In this spirit he constructed his differential lamp, with which, and his alternate-current machine, the firm put up their first installation with a divided-regulator light in the Kaiser Gallery in Berlin in 1879, and similar ones shortly afterwards in the railway stations in Berlin and Munich. Herr von Hefner-Alteneck's more recent work was specially connected with the improvement of the various kinds of apparatus required for electric lighting. This occupied him till 1883, when he proposed a new unit of light, consisting of a small and very simple lamp in which amyl-acetate burned with an unvarying height of flame. This unit, as our readers are aware, is now almost exclusively employed in Germany as a standard of light; and its adoption as the practical international unit was recommended by the Electrical Congress held at Geneva in 1896. In the paper on "Technical Standards of Light" read by Dr. Bunte at the meeting of the International Photometric Committee at Zurich last June, he referred to the Hefner unit as the one most definitely established. "In course of years," he said, "the Hefner lamp has found more and more general acceptance as the standard of light in ever-widening circles in the lighting industries and scientific laboratories. If, therefore, it is desired to select from among the present standards of light one to serve as a basis, the Hefner unit clearly commends itself for the purpose at the outset." This, coming from such an authority, is very high testimony to the merits of the lamp. Herr von Hefner-Alteneck retired from the firm of Messrs. Siemens and Halske about fourteen years ago, and occupied himself in studying electrical regulation and research generally; and it is to be greatly regretted that his sudden removal has put an end to these labours, which could not have been otherwise than profitable. He was a member of the Royal Academy of Sciences in Berlin, and foreign member of the similar institution at Stockholm. He obtained his degree of Ph.D. *honoris causâ* from the University of Munich.

The death occurred on the 3rd inst., at his residence at Wrexham, of Mr. W. J. Sisson, who for many years was a conspicuous figure in the commercial life of the borough, and was Chairman of the Wrexham and East Denbighshire Water Company. The deceased gentleman was in his 76th year.

On New Year's Day, the death occurred of Mr. George Tuckwood. Deceased, who was in his 86th year, was one of the best-known citizens of Lincoln. As long ago as 1841, he was appointed an Auditor of the old Water Company; while he was also for forty years a Director of the Gas Company. He was Chairman of the latter concern at the time the undertaking was acquired by the Corporation.

We are pleased to record the success of Mr. Cecil Colson (the youngest son of Mr. Alfred Colson, of Leicester), who is one of the thirty-six successful candidates for entrance to the Royal Military Academy, Woolwich. Out of 230 who sat, Mr. Cecil Colson was twenty-fourth on the list.

USE OF FLUELESS GAS WARMING-STOVES.

Communicated by H. Leicester Greville, F.I.C., F.C.S.

The recent investigations of Dr. Thorpe mentioned in the "Journal" of Aug. 18, and subsequently commented on in the leader of Nov. 24, have naturally directed attention to what is now practically an old subject. You rightly call attention to the limited nature of the investigation—viz., the search for what may be termed limited combustion products, such as carbon monoxide and acetylene, ignoring sulphur products and the question of humidity, one might add also carbon dioxide. It is obvious that any consideration of the results of discharging the whole of the combustion products from any fuel used for heating purposes into an inhabited room must embrace a complete investigation of the whole subject to be of material use, and should not be limited in its character. It is singular that so eminent a chemical expert as Dr. Thorpe, experimenting on such an important subject, should not have investigated the whole matter more completely. Perhaps his instructions did not permit of such a wide scope of operation.

There is no reason to suppose that the products of the combustion of gas by burners, either of a luminous or of a non-luminous character, should differ when burnt in the comparatively open atmosphere of an ordinary room, or within the comparatively limited area of a gas-stove, if supplied with a sufficient quantity of air to ensure complete combustion. With regard to the evidence of such products of incomplete combustion as carbon monoxide and acetylene from ordinary gas-burners, we have reliable figures and evidence of many years' standing. A valuable article on the subject appeared in the "Journal" for Nov. 19, 1895, by Mr. Lewis T. Wright. In this, allusion is made to German investigations, in which it is concluded that the use of Welsbach, argand, and flat-flame burners is unattended with danger of poisoning by carbonic oxide. Further experiments by Mr. W. Thomson (in a paper read before the British Association in 1890*) are also quoted. In this case, the conclusion arrived at was that "the gases escaping unconsumed" from the various burners, both lighting and heating, would indicate that combustion was not, in the cases under investigation, so complete as might be desired.

Mr. Wright, in criticizing the conclusions arrived at, points out that the method of investigation was not above suspicion of fallacious results. Mr. Thomson relied on the development of carbon dioxide by passage through heated copper oxide of the products of combustion, after all the carbon dioxide and water vapour had been previously removed. Mr. Wright points out that, in the absence of blank experiments on the surrounding atmosphere, which might contain naturally existing organic impurities, or even contamination from a leaky gas connection, the results could not be regarded as being altogether reliable. Somewhat later, an inquiry was carried out in the "Lancet" laboratory, under the most stringent conditions, with regard to the nature of the combustion products from Welsbach, argand, and Bray burners, with entirely negative results as to the presence of carbon monoxide or acetylene.

Mr. Wright subsequently made experiments on the same subject. In his case, the combustion products from various burners were tested under regulated conditions. The gas was burned in small apartments, the atmosphere of which was specially tested as to its freedom from unconsumed coal gas. The combustion products were drawn from tubes placed over the respective flames, and were passed through cotton wool, to remove dust, organic matter, &c., and then through soda-lime to absorb carbonic acid. The subsequent gas, passed through specially prepared pure heated copper oxide, failed to develop the slightest trace of carbonic acid, proving unmistakably the absence of carbonic oxide or unconsumed coal gas. There is no doubt that in all experiments on this subject a blank experiment on the purity of the surrounding air should be made; and though this precaution was not adopted in Dr. Thorpe's experiments, the general results with regard to the possibility of the existence of incomplete combustion products from efficiently burnt gas and oil, they must be regarded as eminently satisfactory.

With regard to the question of sulphur compounds, I do not happen to remember any published statistics; but I investigated the subject partially many years ago when the so-called "Syphon stoves" first came into existence; and the results may be of interest as helping to fill up the missing link in Dr. Thorpe's experiments. I find on reference to my notes that the main object of my investigation was as to the extent to which this form of stove reduced the proportion of the sulphur products arising from the combustion of the gas. I find also that, incidentally, some temperature determinations were made, and in one case an analysis of the escaping gases from the stove, but with no object of specially searching for such compounds as carbon monoxide or acetylene. Some twenty years ago (the date of my researches), I seem to have considered such a refinement unnecessary, or rather that such incomplete combustion products were quite unlikely to exist under the circumstances. Subsequent evidence seems to have justified my conclusions.

The stove was of the now well-known character—a vertical central tube in which the gas was consumed in an argand burner;

* See "Journal," Vol. LVI., pp. 602, 612, 991, 996.

the combustion products passing subsequently through two vertical side tubes, and thence into the air. A tray beneath received the condensed combustion products.

The following table gives the details of the tests :—

Consumption of Gas per Hour. Cubic Feet.	Total Sulphur in Gas. Grains per 100 Cubic Feet.	Sulphur removed by Stove.	Percentage of Sulphur removed by Stove.
5·0	17·8	10·5	59·0
5·0	10·2	6·2	60·0
5·4	9·6	6·1	63·5
6·0	9·5	6·1	64·2
7·6	9·2	5·9	64·1
9·0	10·9	6·0	55·0
Mean percentage of sulphur separated by stove			60·9

It might have been expected that some explanation of the causes of varying efficiency might have been traced; but it is difficult to form any conclusion, either derived from different rates of combustion or from varying proportions of sulphur in the gas. A special series of experiments as to the temperature of the combustion products leaving the apparatus gave the following results. The temperature of the atmosphere was not recorded; but the weather was cold, and no other stove was in the room.

Consumption of Gas. Cubic Feet per Hour.	Temperature Outlet of Central Tube, Degrees Fahr.	Temperature Outlet of Side Tubes, Degrees Fahr.
5	150	106
6	160	112
7	182	123
8	190	127
9	202	131
10	214	135

Some further experiments were made on a larger form of stove of the same type, with the exception that the combustion products passed to the closed top of a comparatively high metallic column, and then downward between this and an external radiating column, from the upper outlet of which they escaped.

Gas. Cubic Feet per Hour.	Sulphur in Gas. Grains per 100 Cubic Feet.	Sulphur Separated by Stove.	Percentage of Gas Separated by Stove.
4 to 6	9·6	8·5	88·5
	8·2	6·5	80·0
	9·2	7·2	78·2
	8·5	8·0	94·1
8·5	10·5	7·5	71·4
9·3	10·1	6·2	61·3
Mean percentage of sulphur separated by stove			78·9

A further series of experiments made on gas containing a higher proportion of sulphur gave:

7·5	19·5	16·9	86·6
6·5	20·0	18·3	90·1
7·0	19·0	15·5	81·5
8·4	106·0	81·3	76·8
Mean percentage of sulphur separated by stove			83·7

With the gas burning at the rate of 8 cubic feet per hour, the composition of the combustion products (by volume) was as follows:—

Nitrogen	78·68
Oxygen	16·46
Carbon dioxide	1·74
Water vapour	3·12
Sulphurous acid	Trace

The action of this class of stove in separating such a large proportion of sulphur from what would naturally exist in the normal combustion products is certainly remarkable. The condensed liquid—of course, water arising from the combustion of the hydrogen and hydrocarbons in the gas—was always acid, and contained a large proportion of ferrous sulphate arising from the action of the sulphurous combustion products on the metallic iron of the condensing tubes of the stove. The peculiar feature is that so much of the sulphur dioxide normally present as a combustion product, passed into sulphuric acid. No doubt the presence of moisture and heat came largely into play; but what part did the metallic iron take in the reaction? A similar result takes place where copper tubes are employed; and I have read of a case where the life of the apparatus was comparatively brief, and solid copper sulphate was discovered on a dissection.

What results would be obtained *quo ad* sulphur where the combustion products were cooled by a non-metallic surface? This question has to be answered. Taking present statistics with regard to the completeness of the combustion of gas burnt in the ordinary way, and the possible elimination of the major quantity of the sulphur by the condensing forms of stove at present in use, there does not seem any material objection to their employment in an ordinary well-ventilated apartment. They must render the air of the room moister by reason of the combustion products constantly escaping saturated with aqueous vapour at a comparatively high temperature. At the same time, is it wise to constantly vitiate the air of a room with carbonic acid? It is surely wiser and more sanitary to provide an exit for it into the open air. This consideration must not be forgotten—in fact, it should be emphasized.

The great attraction of one of this class of stoves in a room is the utilization of the whole of the heat to be obtained from the combustion of the gas; and the argument is used that if no harm ensues from having two or three burners for lighting purposes, what prejudicial effect can possibly ensue from consuming the same quantity of gas in a flueless stove. The only answer is the possible danger of the undue contamination of the air of the room from the escape of partially cooled combustion products at a comparatively low level in which they must rise with and diffuse into the surrounding air. Where gas is used for illumination, the conditions are different; and the highly-heated combustion products no doubt escape without any material effect on the atmosphere of the room, except the beneficent one of promoting ventilation.

CARBON MONOXIDE GAS AND CONDENSING GAS-STOVES.

Communicated by F. R. E. Branston.

When tests are made of condensing gas-stoves in which the presence of carbon monoxide gas is found, it clearly demonstrates faults in their construction and working, which are by no means necessary, and which should be avoided. Carbon monoxide gas is formed by the product of combustion (carbonic acid gas) passing over burning carbon deposits, when it takes up carbon and becomes carbonic oxide or carbon monoxide gas. It is therefore an important point in the manufacture of apparatus of this sort that there should be no obstruction of any kind or form within at least 2 feet from the burner, so that the hot gases may not be impeded or congested, but allowed a free passage and sufficient room for their natural expansion, in order that, in the event of carbon by any chance being formed, it may not come in contact with, or be in any way affected by, the flame of the burner.

This was clearly explained by Dr. B. W. Richardson, F.R.S., in a lecture delivered by him before the Society of Arts, when he described the lethal chamber which he had designed, and had been built at the Dogs' Home at Battersea. He said he got the maker of a condensing gas-stove to alter it for him so that it would produce carbon monoxide gas, by placing a small chamber in the furnace, directly over the cylinder or chimney, in such a manner that it would obstruct the free passage of the gases. There was a door through which he could insert pieces of charcoal, so that when they were put in, by merely turning the tap, they were immediately set alight when the gas was ignited—letting the flames of gas play through the charcoal. In this way, he was able easily to make sufficient of this poisonous gas for the purpose he required. This not only proves how necessary it is to be careful in the selection of this kind of apparatus, but how easily the gas referred to can be formed in stoves which are not designed expressly to avoid the chances of its formation, and that it is by no means necessary to make these stoves in a way to render them liable at any time to cause this very serious defect.

A properly-designed luminous burner of circular form, made in this country, in conjunction with a well-constructed governor designed expressly for the purpose, and tested before being fitted, placed in a stove without the defects which have before been alluded to, will not cause the formation of carbon monoxide gas. Foreign manufactured burners made for lighting purposes are not suitable for the purpose of burners for condensing gas-stoves. They are liable to cause the formation of carbon monoxide gas, as the steatite rings, being made very thin, will not withstand the changes of temperature to which they are subjected, and, in consequence, are liable to crack, causing the flame to smoke, and form carbon deposits. Without any proper governor, they are liable to be affected by any change of pressure, which is also detrimental to their proper working. If one size of burner, with governor attached, was fixed upon by the gas companies, and made a standard size, together with a suitable glass, it would go a long way towards ensuring the proper working of these stoves; and if the makers were obliged to conform thereto, it would not only save officials endless trouble and loss of time, but would tend greatly to obviate all chance of the formation of carbon monoxide gas, and secure to this system of warming stoves the reputation it has obtained and the credit it justly deserves.

Gas-fires can also be secured now as efficient in working as the stoves with the circular light-giving burners, provided that the gas-fire is properly fitted to the condensing apparatus, and provided also that the same conditions are obtained in the apparatus—the radiant heat from the fire being the same in proportion as that obtained from the circular flame. But the fire being open, the products of combustion are not so easily drawn into the condensing apparatus. In selecting stoves of this kind, if a lighted taper be drawn along the top of the front of the gas-fire, it will be easy to determine to what extent the products of combustion are being dealt with in the desired manner. If the light of the taper is put out, the stove is unfit for use.

This system of heating is well worthy of the careful attention of all gas companies, as by it they are enabled to compete very successfully in this direction with the electric current, and to bring the cost of warming by gas far below that of ordinary coal-fires. So by supporting the manufacturing firms who are endeavouring to produce apparatus free from the defects which have been pointed out, they will not only benefit their shareholders, but will confer on the inhabitants of our large cities even a greater boon than they have already done by the introduction of the use of gas on the prepayment system.

STEAM IN WATER-GAS MANUFACTURE.

The last number of the "Journal of the Society of Chemical Industry" published in the past year contained the text of a paper, read in the Canadian Section of the Society by Mr. G. W. M'KEE, on "The Economic Admission of Steam to Water-Gas Producers of the Lowe Type." The following is a reproduction of the principal portions of it.

It is the general practice of water-gas operators to vary the quantity of steam admitted according to the conditions of the producer; these conditions being: (1) The temperature in the generator judged by the length of the preceding "blow;" (2) the depth of the fuel bed; (3) the question as to whether an up or a down run is being made; and (4) the length of time that has expired since clinkering. The amount of steam admitted is judged by the number of turns given to the valve, sometimes checking the working of the steam line by an observation of the nozzle pressure, taken from a Bourdon gauge placed on the wall. The important point to which it is desired to call attention is that in every case the steam-valve is left open to the same extent during the whole run.

If we consider the reaction for the formation of water gas—

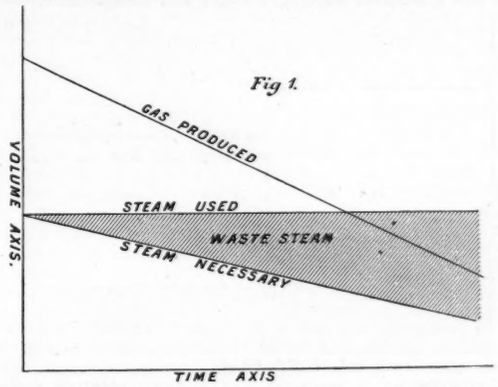
$$\underset{1\text{ vol.}}{C} + \underset{1\text{ vol.}}{H_2O} = \underset{1\text{ vol.}}{CO} + \underset{1\text{ vol.}}{H_2}$$

we have one volume of steam yielding two volumes of gas. Of course, above 1200° C. the reaction is complicated by the fact that hydrogen acts directly on carbon, forming marsh gas, ethyl hydride, acetylene, &c.; but, since the percentages of these gases in water are small, we may, for the purposes of the following argument, leave them out of consideration. Of two things, we are sure: First, the volume of steam used should, at corrected temperature and pressure, be approximately one-half that of the gas produced; secondly, if any undecomposed steam gets through the machine, we are not running up to the highest efficiency. For (*a*) it is costly to produce the steam in the boiler-room; (*b*) the surplus steam passing through the generator has to be raised to the heat of the coke, and this heat is abstracted from the machine; (*c*) this steam must again be condensed in the condensers, thus necessitating the pumping of extra condenser water; (*d*) furthermore, the reaction—

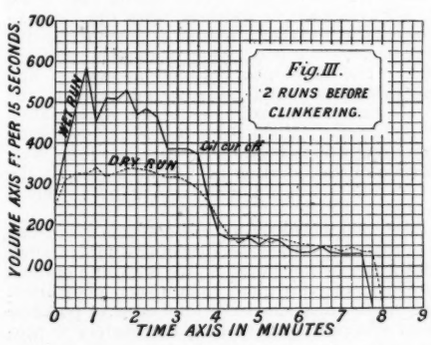
$$H_2O + CO = CO_2 + H_2$$

is liable to be set up in the space above the coke, and in the carburettor and superheater settings. The reaction begins at 625° C., and comes to an equilibrium which is in accordance with the temperature prevailing in the machine.

The experiments which follow were conducted in three water-gas machines; two of them being those of the United Gas Improvement Company, and the third of the Western Gas Construction Company of Indiana. The length of blow was six



minutes, and the length of run eight minutes. In the first place, it was observed, from the scale-board in the operating room, that by far the greater portion of the gas made during the run was obtained in the first three or four minutes. A ¼-inch pet-cock was then attached to the superheater of one of the machines, and a "dry run" was made. A thin-walled glass Liebig condenser was attached to the pet-cock, and it was found possible to condense water out of the gas at the latter part of the eight-minute



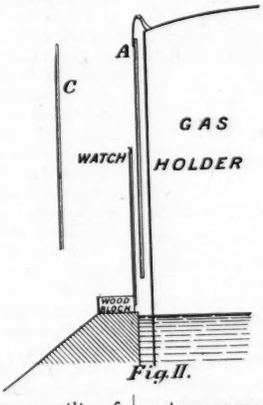
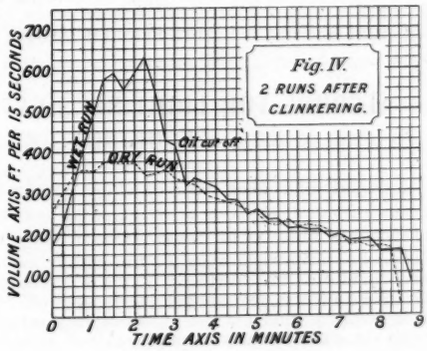


Fig. II.



period. Comparing, then, the gas produced and the quantity of steam employed, Fig. I. may be expected to represent the condition of affairs.

In order to accurately determine the amount of gas produced at short intervals, and to establish a curve on the lines indicated above, various devices were tried, including Pictet's meter; but the best results were obtained by a direct measurement of the rate from the relief holder. A long rod A (Fig. II.) was suspended from the railing that went up and down with the relief holder by means of a strap iron hook. At intervals of about 30 centimetres, gimlet holes were made in this rod. A second rod B, of the same dimensions as the above, was made, and pointed at one end. The other end was secured to a heavy wooden block placed on the stone coping of the gasholder, and held in place by weights. A third strip C was prepared, with a thumb-screw in one end, and strips of heavy paper secured to it by tacks. In this way the rod C could be quickly fastened to A in such a manner that the upper part of the strip of paper on C would be level with the bevelled point of B. A small hook was screwed into B at the point indicated; and a watch was hung on it. All the water-gas machines except one were stopped, and the exhauster pumping from the holder was also stopped. When the machine began the run, the holder would begin to rise, and every 15 minutes marks were made on the strip of paper opposite the point of B. The strips of wood were sufficiently thin to permit of them all being grasped in the left hand at once, and so the above markings could be quickly and accurately made. These measurements were continued over several days with both "dry" and "wet" runs.

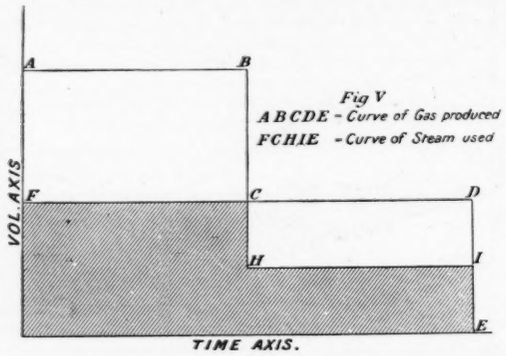
The best curves were obtained on calm days, as the slight movements of the holder caused by wind showed in the curves which were subsequently plotted. It was also found possible to obtain fairly good curves with the exhauster running, by the engineer maintaining it at a constant rate, and by noting the rate from a slip of paper both before and after the run. Very accurate measurements were taken of the capacity of the holders, and a table prepared for convenience in calculation. The distances between the marks on the strip of paper were transferred to a finely-divided rule with dividers—thus giving the number of inches between the markings. By consulting the table, this was readily transferred to cubic feet of gas made per 15 seconds.

In the curves produced (Figs. III. and IV.), we have nearly one minute consumed in reaching the maximum rate of output. This is accounted for by the following facts: (1) The initial fraction is cooled below its average temperature on entering the condenser. (2) In the case of a wet run, a certain amount of time is used up in admitting the oil, the inflow of which gradually rises to a maximum. (3) The mains and gas already in the holder are further removed from the temperature of the first fraction of the gas than from that formed in the succeeding part of the run. For these reasons, the true curve of make conditioned by the internal state of the generator should, without doubt, be parallel to the time axis. This fact would tend to increase the output of the first three minutes above that shown in the curves actually obtained, and, *ipsa causa*, decrease the output of the latter part of the run. This would be an added argument for the method of operating proposed later on.

From the curves shown, it is apparent that the curve falls off enormously between the third and fifth minute in every case, which is about the time that the oil is cut off in the production of a gas of from 18 to 25 candle power. It would seem to be well, then, to bring the steam supply down to one-half directly after cutting off the oil supply. This would be in accord with the convenience of the men in operating the machines. Furthermore, it would be approximately correct, and would allow the machine to have its full capacity during the beginning of the run, thus securing the maximum daily output. This being settled upon, it becomes of importance to know just how much steam passes the inlet-valve, and how much it is necessary to close the valve to cut

that supply down to one-half. A series of experiments were made on globe valves to determine the above, and it was established beyond a doubt that no simple relation exists between the number of turns a globe valve is opened and the amount of steam which passes in a given time. Some better control of the steam is evidently necessary. This is to be found in the nozzle pressure appliances which are attached to most water-gas machines.

From actual experiments carried out, extending over more than a month, in which the nozzle pressure was cut down by one-half after the fourth minute, a considerable saving in coke was effected; and the composition of the gas was, in a measure, also modified—its content of carbon dioxide being lowered. Under this system of working, the gas and steam curves would



resemble Fig. V., though a curve of this kind was not actually taken from the machines. The above remarks apply where gas coke is used in the generators; but modifications may be expected in cases where anthracite coal is employed. From the curves taken just after clinkering, it is apparent that the machine's capacity could be increased by dividing the blow into three periods, and cutting down the steam to one-third each time. It being possible, therefore, to approximately regulate the amount of steam admitted during the run in accordance with the curves obtained, the yield of gas is increased, and the machine can be run up to its highest efficiency, owing to the fact that the conditions causing imperfect washing, indicated under (*a*), (*b*), &c., no longer exist.

ALCOHOL FOR LIGHTING, HEATING, AND COOKING.

A despatch has been received at the Foreign Office, from H.M. Consul-General at Rio de Janeiro, calling attention to new branches of industry in Brazil. One of these is the production of alcohol from sugar-cane for the cultivation of which the soil and climate of the Northern States of Pernambuco, Bahia, Rio Grande do Norte, &c., are peculiarly adapted. The idea prevails that compensation for the unsatisfactory returns now obtained from sugar can be earned from the sale of its bye-product alcohol; and active measures are therefore being taken to make known its various uses, and the many forms in which it can be utilized for public, domestic, and industrial purposes. At a recent exhibition of machinery and appliances employed in the production of alcohol and of apparatus in which the liquid can be used, it was demonstrated that alcohol can in many cases be used as a substitute for gas, electricity, or petroleum. Its adaptability for lighting and heating purposes was, it is reported. clearly established. It was made to supply motive force for industrial machinery and the propelling of river launches; and it was shown to be a most useful auxiliary for household services, such as cooking, the heating of box-irons, &c. The Consul-General remarks that the exhibition has certainly been successful in the furtherance of its object—practical results having followed in the substitution of alcohol for public lighting (in place of petroleum) in more than one of the smaller country towns; while the Government have been authorized by Congress to enter into arrangements for the lighting of all railway stations with it in preference to petroleum, which has hitherto been used.

The "Royal Era" Mantle.—A Syndicate has been formed for the introduction of mantles which will be known as the "British Standard" and "Royal Era." They have already commenced manufacture and business at Wandsworth; and an inspection of their productions afford the justification for the statement in a circular letter they are issuing, that those responsible have made a special study of the manufacture of mantles, and that they have been successful in producing an excellent article after considerable experiment. The mantles are made in three qualities—the finest cotton, ramie or Indian silk, and double-woven fabric, the last named possessing great strength and durability. Among other points to which they direct attention, are that the very best chemicals only are used, that British workpeople are employed in the manufacture, and that the mantles are cheap.

AMERICAN GASLIGHT ASSOCIATION.

Notes on the Annual Meeting.

In previous issues of the "JOURNAL," we have noticed the most interesting features, from a technical standpoint, of the proceedings at the last annual meeting of the American Gaslight Association, which was held at Detroit (Mich.) under the presidency of Mr. Alten S. Miller. There were, however, some general matters which engaged the attention of the members; and these, with a few notes on the discussions, we now give.

Dealing first with the internal affairs of the Association, the Treasurer (Mr. A. E. Forstall) presented a report which showed not only a good balance in hand, but a roll of 11 honorary, 560 active, and 109 associate members, after allowing for 14 losses by death or resignation. The next matter of interest was the presentation of the report of the Trustees of the Gas Educational Fund, to which the Association contribute £50 per annum. They stated therein that, the first period of five years having expired, it had been necessary to make a second appeal to the subscribers; and the response had been so far satisfactory as to enable them to enter upon a second five years. Further help was, however, solicited. The Correspondence Class included 81 names—the students numbering more than 100; and the names of 11 students who had satisfactorily completed the three years' course were given. It had been decided to extend the condition of eligibility to include employees of companies engaged in the manufacture of apparatus and appliances for the production, distribution, and consumption of illuminating gas. The income for the year was about £870, the expenses were £800, and the surplus invested funds amounted to £700. It will doubtless be remembered that Dr. A. C. Humphreys read a paper in which he described the work carried on in the Correspondence School during the last five years. Before the discussion upon it was opened, the Secretary read a letter from a member of the first section of the Educational Class, speaking highly of its value to students who had completed their school education, and were entering upon practical work. Mr. Searle said he had noticed students at work on the questions, and found that in preparing their answers they referred to standard works, and thus became familiar with a great deal of matter that could not but be useful. Mr. Forstall, in speaking upon the value of education, remarked that the earlier attempts at generator firing were not successful, because the underlying principles were not clearly understood. The difference between knowledge and ignorance of these principles might mean 20 per cent. in the make per retort. He gave actual examples of the appreciation of the class, and the benefits gained from it. Mr. C. Nettleton and Mr. R. Brown strongly supported the work. Mr. John West referred to the position of the question in England, and to the work done by the City and Guilds in London and at the Technical School in Manchester.

The Committee on Municipal Ownership presented an interesting report. It set forth that the present number of gas undertakings owned by local authorities in the United States is 18, and of these only six represent districts having more than 20,000 population. Besides these, there are five districts partly interested, or purchasing in bulk. A short synopsis of the principal transfers in progress, and changes in the laws during the year, as affecting the question, was included. In 185 districts there are municipal electricity supply works; and besides this number, there are 84 partly concerned. But probably the majority of the electricity undertakings are for public lighting only.

Coming to the technical matters, the delivery of the lecture by Professor A. H. White, on "Various Gases in Gas-Engines," gave rise to a short discussion, in the course of which Mr. Forstall inquired how the extra compression at the works was compensated for, if the efficiency of blast-furnace gas was greater than that of water gas by reason of a higher compression temperature. Mr. Doherty expressed faith in the future of gas-engines, which, he said, were now largely used at electricity-supply works. The author quoted the calorific power of blast-furnace gas as being 111 B.T.U. per cubic foot, which meant practically no carbon dioxide in the gas; and he understood gases as poor as 50 to 80 B.T.U. were successfully operated. In replying, Professor White said that, according to theory, the work done by the gas in expanding was equal to that applied in compressing it; but in practice there was some loss by conduction and radiation. If water gas also was compressed, a similar increase of duty would be obtained from it. The practical effect of compression was to lengthen the working stroke.

The above incidental reference to water gas fittingly leads to a notice of the remarks on the interesting paper read by Mr. W. Cullen Morris on "The Operation of Large Carburetted Water-Gas Sets." It was opened by the Secretary reading a communication from Mr. W. E. M'Kay, in which he directed attention to the importance of measuring the steam used—not only the quantity actually admitted, but that actually decomposed and converted into permanent gas, and the excess which escaped such decomposition. Any two of these being known, the third could, he said, be calculated. To gauge the supply of steam, he disconnected the pipe from the shell, and joined it up to a condenser consisting of a barrel containing water, supported on portable scales. The gain in weight per minute or other suitable unit of time indicated the

quantity of steam supplied to the generator. Analysis of the gas gave the proportion of decomposed steam; and the excess steam could be arrived at by gauging the yield of water, and allowing for the vapour retained by the gas. The excess steam as determined by collecting the condensed liquids was about 10 per cent. less than the sum indicated by subtracting the amount of "decomposed" from the total supplied. The steam dissociated was about 15⅓ lbs. per 1000 cubic feet of gas. Deducting this from the figures of "total steam" quoted, the net excess steam varied from 4⅛ lbs. to 14¾ lbs. per 1000 cubic feet of gas; and the costs per 1000 feet appeared to vary directly as this excess. But many other factors entered into the question. When working a set in 1891, he found that the best results were obtained with an excess of 16½ lbs. of steam per 1000 cubic feet; and in some careful tests lately made with a 6½-feet generator, the best results were realized with an excess of 10⅓ lbs. to 13½ lbs. of steam. The make per square foot of grate per hour was from 1500 to 1800 cubic feet. A marked variation in the flow of steam was followed by a variation of carbon dioxide, and the temperature of the fire was affected by the steam, as the excess carried away heat, and was turned to good account further on, in the carburettor and superheater. Each pound will carry forward about 537 B.T.U.; and in the highest case cited in the paper, the heat so carried away would be 8000 B.T.U. per 1000 cubic feet of gas. The excess of steam did useful work in the carburettor—graduating the gasification of the oil and preventing "cracking," and also in regard to the sulphur impurities in the gas. A properly adjusted excess of steam also played an important part in the process of clinkering the fires. Not only the quantity of steam, but also the pressure, was improved, though why the pressure should exercise so much influence on the working was not clearly understood. Mr. Rollin Norris quite agreed that the excess of steam under the best working conditions was about 100 per cent. It was necessary that the supply of steam should be more accurately adjusted than was possible with an ordinary valve. Mr. I. N. Knapp said there was a mechanical difficulty in regard to the distribution of steam in a large set. In an 11-feet generator, it required careful watching, in order to secure even heating in every part of the grate surface. Mr. F. D. Miller urged the importance of a sufficient temperature in the generator. He said he always kept it up to 1800° Fahr. Mr. Morris, in replying, admitted the influence of steam pressure, but said he could not explain it. Mr. M'Kay did not give the blast pressure in connection with his rather high make of 1800 cubic feet per square foot of grate area per hour. He had increased the yield of 11-feet generators from 1,800,000 to 2,500,000 cubic feet per day by raising the blast pressure from 21 to 25 inches—thus decreasing the length of the blow and increasing the number of runs per hour. He was asked why he reversed the steam in the middle of the run. The object was to secure a more uniform condition in respect to clinker. He agreed as to the importance of a uniform distribution of steam.

The paper on "Municipal Ownership," by Mr. H. L. Doherty, some extracts from which were given in the "JOURNAL" for the 8th ult., was discussed at length. Professor Mavor remarked that the threat of municipal ownership had a deterrent effect on investment. Capitalists did not want competition with municipal plant, or to be compelled to sell at a structural valuation. Trading operations were not an essential or a natural part of the functions of municipal government, and they should not enter upon anything outside police power or protection of life, health, and property. It could not be proved that a gas undertaking came under any such category. He agreed that municipal ownership with operation of industries was wrong in theory; and on visiting municipally owned plants and examining the accounts, he had seen that it was wrong in practice. The Secretary argued that properly controlled private ownership was better than any public one. Mr. Walton Clark said that the want could be best met by Government control of public companies, sufficient to prevent injurious exploitations either of the consumers or the stockholders. Uncertainty of tenure always meant inadequate and costly service; and companies should be assured that if they lived up to their obligations, their interests would be respected. The cheapest and best service in public utilities would be obtained by leasing them to public companies, and allowing these bodies perfect freedom in the management of their business. The so-called monopoly of light or anything else had disappeared under the progress of modern invention. Mr. F. D. Miller said every public company in the land was oppressed by the prospect of having to fight for its life, and was obliged to lay up the sinews of war so as to master the position when it came. As the author had said, they should do away with this continual threat, and the plant could then be operated at a lower interest, which meant a cheaper service. Every facility should be given to the promotion of joint-stock enterprise, which enabled the poor man's dollar to earn as much as the millionaire's. Regulated monopolies were desirable; and, under some circumstances, they served the public better than competitive concerns. Mr. Doherty, in reply, said he had not attempted to prepare an exhaustive statement of the case against municipal ownership. There were many arguments that might be added. The subject was one that should be continually before them; and it was not wise to ignore it.

We come now to the "Question-Box." The questions received had been circulated among the members in advance, with the result that a number of written replies had been handed in. For a simple economical anti-fluctuating arrangement for use with gas-engines, Mr. C. H. Graf recommended a cock at the inlet of the gas-bag, to be turned back until just enough gas passed, and no more; Mr. R. M. Searle also recommended a controlling cock, together with two bags in tandem; Mr. J. Somerville used a chamber, such as an empty meter case, on the inlet, and Mr. Ferrill found a diaphragm governor fairly successful. Mr. Klumpp preferred the regulating cock, together with a chamber between it and the bag. He remarked that oscillation was always reduced by increasing the size of the pipe between the bag and the engine, and throttling the supply. Mr. R. L. Kenah used a diaphragm governor and a chamber. Mr. Forstall instanced the importance of a sufficiently large gas-bag. Mr. Fickert described a device comprising a small fan actuated by the engine, fixed in the inlet, which raised the pressure to 4 inches, and delivered into a tank or chamber, the outlet of which was fitted with a weighted valve. Mr. R. R. Young described an oil or hydraulic seal to take up the oscillation.

Speaking in reply to a request for particulars of experience in the use, and opinions as to the value, of the so-called gas "arc" lamps, Mr. E. G. Pratt said that no doubt, according to theory, a cluster of four lights gave less effect than the four placed separately; but they had to recognize the fact that most consumers liked the gas "arc," and would use it in preference to the electric arc. With it they could successfully compete with the latter; and it was the best available method of dealing with large areas. Mr. G. W. Clabaugh said the average customer knew nothing about technical questions, but he did know that the gas arc was as good as the electric, and could be run at half the price. If people could not get what they fancied, they would not have anything at all; and if the people wanted gas arcs, the gas company should be in a position to supply them. He advocated further endeavours to improve these lamps, particularly in respect of the quality of the mantles as affecting the colour of the light. The President said that no argument had been advanced in favour of the gas arc. It was simply said that the public demanded it. He thought the demand for gas would suffer because many of the high-power lamps were ugly, and prejudiced people against the use of gas. Electricians applied ability and good taste to the ornamentation of lights; and he thought that gas people should do the same. Mr. W. C. Morris said it appeared to be taken for granted that the consumer wanted the gas arc; but he thought the truth was that these lamps were pushed because nothing better offered. Mr. Walton Clark instanced a case in which cluster lights gave a better, more attractive, and handsomer effect than single burners, and thought there could be no doubt as to the public demand for the gas arc.

DEFECTS OF UNCARBURETTED WATER GAS AS FUEL FOR LABORATORY USE.

There was a paper read at the meeting of the London Section of the Society of Chemical Industry, at Burlington House on Monday last week, which has an interest, in an indirect way, as a contribution to the general subject of uncarburetted water gas. The authors are two chemists in Kyoto—Drs. Chikashigé and Matsumoto. The paper had been sent to Dr. E. Divers, F.R.S., who claimed the first author as a former pupil, and the second as a grand-pupil. While disclaiming all responsibility for the paper, Dr. Divers, recognizing its value, undertook to read it. The greater part of the experimental work contained in it has only an academical interest, and would, even if the paper were available for reproduction, have little real value for our readers. Therefore, some notes taken during the reading of the paper are all that need, or can, be given; and they perhaps may be suggestive of further research work.

An opening remark of the authors was that, to those who have to find a gas fuel for their laboratories, water gas commends itself by the little room taken up by the apparatus for making it, and by the relative simplicity of its manufacture and purification. However, the authors had endeavoured to make use of water gas in bunsen burners in their laboratories; and having become convinced of its inconveniences for this purpose, they offered the information gathered in the hope that it would interest others in the problem of its utilization. The gas which they used was analyzed from time to time. Its average composition was as follows: Hydrogen, 48·8 vols.; methane, 0·8; carbon monoxide, 33·1; carbon dioxide (with some hyd.-sulphide), 8·5; nitrogen, 8·5; oxygen, 0·3. The gas was purified only to the extent deemed sufficient, and was supplied under a pressure of 5 centimetres of water. The plant was set up near to the laboratory; but the gas had to pass through iron pipes. Consequently, iron would have been taken up by the carbon monoxide, and be present in the gas as iron carbonyl.

Adverting to the use of the bunsen burner with water gas, the authors stated that the composition of the gas made the air-ways to the burner almost useless. A problem which had been solved by the authors was as to the order followed in the combustion of the water-gas mixture, to find out whether the hydrogen and carbon monoxide burned together, or one before the other. As water gas, when fed with air, burned with a flame having the usual two cones, and could be separated by Professor Smithells'

apparatus, an answer could be obtained to this question. An experiment was made, and gave the result shown in the table, in which are also given Smithells and Ingle's results

Partly Burnt Gas.	Water Gas Per Cent.	(Smithells and Ingle.) Coal Gas Vol. Per Cent.
Water	17·0	14·9
Hydrogen	20·0	10·9
Methane	0·3	trace
Carbon monoxide	19·5	10·2
Carbon dioxide	8·8	3·8
Oxygen ,,	0·1	—
Nitrogen ,,	14·3	60·3

with coal gas. The numbers given by the water gas showed that about 1 volume of air had been mixed with 2 volumes of the water gas; and that was as much as could be employed. In Smithells and Ingle's experiments, nearly ten times as much air was used—9·6 parts of air to 2 parts of coal gas. Two points of interest in the comparison are that, in both cases, the volume of the remaining hydrogen was about equal to that of the carbon monoxide, and that the percentage of each gas was only half as great in the partly burned coal gas as in the water gas. It was seen that the fact was established that the hydrogen burned before the carbon monoxide. It followed that the inner cone of the flame of water gas and air was that of the burning hydrogen; and in the outer cone of the flame, the carbon monoxide must be the last constituent to burn.

The next part of the paper was devoted to the advantages and disadvantages of using water gas. One advantage remarked upon was that the flame needed no air draught to render it smokeless, and to raise its temperature. However, the authors often felt the want of the power to reproduce the luminous smoky flame of the coal gas. Another advantage of the flame was afforded by its particularly high reducing power. A further property possessed to its advantage was its high temperature. There was, in fact, no ordinary gas-flame that equalled it. Comparatively thick copper sheets and thin platinum wire were easily heated. On the other hand, the authors called attention to the fact that the water-gas flame was much smaller than that of the coal-gas bunsen flame, for the reason that there was so much more to burn in the coal gas. The small flame of the water-gas necessarily increased the consumption of the gas for vessels of the same size, when it was desirable to apply the heat over the whole surface. In order to bring up the volume of the water-gas flame to that of the coal-gas flame, it was necessary to increase the consumption to two-and-a-half times as much. Again, the edges of the flames had a strong oxidizing action on the bottoms of the metal baths used in the laboratory. In addition to this injury, the vessels suffered destruction from the sulphur in the gas. It became almost necessary therefore to replace copper water-baths with iron ones, and to have air-baths with iron bottoms. A great deal of the communication was taken up with this question of injury to metal vessels; and attention was directed to these tables (which were shown on the blackboard) relating to the chemical action produced on metal vessels by the use of water-gas, as shown by an investigation of the deposit on them. The nature of the deposit on porcelain and the action of the gas on platinum were illustrated by the following tables:—

Deposit	0·0097 gramme.
Carbon dioxide	0·0117 gramme.
Carbon	0·0320 ,,
Ferric oxide	0·0100 ,,
Iron	0·0700 ,,

	Found.	FeC_2.
Carbon	31·9	30
Iron	68·1	70
		100

Platinum Capsule.	Weight.
Before heating	4·7661 grammes.
After seven hours' heating	4·7664 ,,
After five hours more	4·7666 ,,
After ten hours more	4·7672 ,,

Alluding next to the poisonous character of water gas, and the danger to health from its escape, the authors stated that even during its burning there might be danger. An account of their experiments on this point were included, and a table of results was given, but the latter, without an exact description of the former, would not convey much of value. Briefly, the experiments were made with water gas supplied with air, so as to form an inner cone to the flame; the gas was burned at the rate of 6 cubic feet per hour; and the flames were reduced by a sand-tray placed above them. The carbon monoxide escaping from the flame was found to vary greatly according to the position of the tray. The meaning of the set of three results, the authors said, was that 0·57 of carbon monoxide escaped unburnt in 100 volumes of water gas. This compared unfavourably with the result obtained by Thorpe with coal gas—0·37 per cent. From equal-sized flames, the carbon monoxide was for water gas 1 volume, and for coal gas 0·37 volume. The authors arrived at the general conclusion that, while thirty coal-gas burners might be kept going in a laboratory without detriment, hardly eleven water-gas burners could be used with impunity.

The discussion was, through the absence of similar experience to that of the authors, rather discursive. It was considered by Mr. Otto Hehner that the authors had proved the point up to the hilt, that the use of water gas in a chemical laboratory was an undesirable thing. The question was a highly important one, seeing that water gas was being used more and more as an admixture with ordinary coal gas. Some of the London Gas Companies used—he believed reluctantly—something like 25 per cent. of water gas mixed with the ordinary coal gas; and the disadvantages which commonly applied to the pure water gas would apply *pari passu* to the mixture. Of course, they had no remedy. They had to use whatever the gas companies chose or were obliged to supply. The question of the injury to health from the use of water gas seemed a most important one, especially where the gas was burnt constantly; but he had never heard of an analyst being injured by almost any emanation from his experiments. Pointing to the importance of the question of the use of water gas and producer gas, Mr. David Howard remarked that their utilization on a large scale had been worked out; but he thought there was a wide sphere for the employment of comparatively small flames, and yet a great deal larger than the bunsen burner. The problem required to be worked out to decide whether small gas furnaces could be worked better with one or the other gas—coal gas, which was expensive, or producer gas, which had the advantage of cheapness. With regard to work in the laboratory, he should try, if he used water gas, the old-fashioned argand burner with a metal tube. It had an immense advantage in certain forms of work, because they could get the heat in greater mass. The question was suggested by Mr. Gordon Salamon as to whether the figures given in the paper would be modified by the admixture of the water gas with oil gas as was customary in gas-works—whether this gas upon combustion would yield *pari passu* the same results as were recorded in the paper.

The next speaker (Mr. Marshall) was concerned as to the influence upon the health of ordinary consumers who had to use coal gas mixed with water gas. Unfortunately, most people did not pay much regard to the ventilation of their dwelling-rooms; and if any amount of carbon monoxide was set free from the combustion of this gas, it was bound to have some effect on the health of people in the rooms in which it was used. The problem, in his opinion, deserved consideration from this point of view. Another member (Mr. Jones), on being invited to speak, said he had only had experience of producer gas, which was a hopeless thing to use in the laboratory, for they had to have their gas-pipes double the diameter, and the india-rubber tubes of an unwieldy size. The point of Dr. Divers' reply to the discussion was the expression of his opinion that he did not think they need fear the evolution of carbon monoxide in any appreciable quantity from ordinary batswing flames.

The Chairman of the Section (Mr. W. F. Reid) conveyed to the authors and Dr. Divers the hearty thanks of the members.

THE MANUFACTURE OF CYANIDES.

In the "JOURNAL" for the 15th ult., it was recorded that a paper on this subject had been read at the meeting of the London Section of the Society of Chemical Industry in the previous week, by Dr. J. GROSSMANN, of the Harpurhey Chemical Works, Manchester. The following is the text of the paper, which, with the notes of the discussion to which it gave rise, is reproduced from the current number of the "Journal" of the Society.

A full account of the bibliography of cyanides up to the year 1902 will be found in an excellent book which appeared during the year [1903], entitled "L'Industrie des Cyanures," by R. Robine and M. Lenglen. Generally speaking, the methods which are used and have been proposed to be used for the manufacture of cyanides are based on the following principles: (1) Conversion of ferrocyanide into cyanide by melting with metallic sodium or other substances. (2) The production of cyanide by the action of ammonia on charcoal and carbonate of potash, or other potash salts. (3) The action of ammonia on metallic sodium. (4) The production of cyanide by the action of nitrogen on charcoal and carbonate of potash or other potash salts. (5) The production from sulphocyanides by melting processes. (6) The production from sulphocyanides in solution by oxidizing processes. (7) The production from "Schlempe." (?)

A few of these processes are more or less well known, and reports on them may be found in the literature and in the patent records of this country; others are still on their trial. In many cases the difficulties of obtaining cyanide have been and are greater than appear on the surface; for it is not only necessary to turn out an article containing cyanide, but the requirements of the market are that the finished product should contain at least 98 per cent. of cyanide of potassium and be free from certain impurities, particularly sulphide. As it is extremely difficult to obtain raw materials free from sulphate, and as at a melting temperature sulphates are reduced by cyanide to sulphides, it is clear that this particularly objectionable impurity will be found in nearly all cyanides which have been produced by a melting process.

The most important question which at present is occupying the minds of those interested in the cyanide industry is to determine which in the future will be the cheapest source from which to proceed. Will it be cheaper to use the cyanogen recovered from coal gas as the raw material for the manufacture of cyanide, or

will synthetic processes prove the cheapest? Mr. Beilby, in his address before the International Congress for Applied Chemistry in Berlin,* has gone into this question, and has come to the conclusion that the future lies with the synthetic processes. But though no one is more competent to speak on cyanides than he, I cannot accept the conclusions he draws from the figures he gives in his address. At the present moment, no doubt the producing power of the different cyanide works is greater than the demand. The Transvaal, which before the war used nearly 3000 tons per annum, has been out of the market for three years, causing a loss of 8000 tons to the commonwealth of the producing nations. Even now it only uses one-half of what it did before the war; and of this quantity a considerable amount is still supplied, under old favourable contracts and at remunerative prices, by manufacturers who are working old, or comparatively old, methods. The brunt of the competition has so far fallen on the operators of new processes, which have no old favourable contracts to compensate them for the present abnormally low prices, and who have still to write off their plant under exceptionally unfavourable conditions. The consumption of cyanide in the Transvaal will have to become normal, and more than normal, before it will be possible to judge which principle of manufacture and which individual processes will prove the best and cheapest.

The cyanogen recovered from gas-works is either in the form of ferrocyanide or of sulphocyanide. Either of these in the form of the soda compound contains cyanogen equivalent to 21 per cent. of ammonia. Reckoning the ammonia value at £45 per ton, the value of the cyanogen is therefore about £9 10s. per ton of ferrocyanide. The value of the soda, calculated on caustic soda, is about £5 10s. per ton. It therefore follows that the intrinsic value, apart from labour and general charges, is £15 per ton. Now it must be borne in mind that if the gas-works were paid for the labour in getting out these products, which, especially in the new processes by Bueb and others, is extremely small, *plus* the price of the caustic soda used, the difference between the cost of these items and the selling price would represent the amount of profit; and the question, therefore, is whether the synthetic processes could compete on the assumption that the gas-works were to turn out sufficient quantities of ferrocyanide or sulphocyanide. As regards sulphocyanides, they may be left out of consideration, as the only economical processes for the recovery of cyanogen compounds from gas are those proposed by Bueb, and similar ones; and these processes do not yield sulphocyanide in any quantity, but chiefly ferrocyanide.

As regards the quantity which the gas-works could produce, it is far in excess of what is likely to be required for the manufacture of cyanides. The gas-works in this country alone could produce sufficient ferrocyanide for the manufacture of 1000 tons of cyanide per week, and to this would have to be added what could be produced in France, Germany, America, and other countries. If we assume that the possible production of the world, from gas-works, of ferrocyanide would be only double that of the United Kingdom, the amount of ferrocyanide available for the world's consumption would be 150,000 tons per annum; and taking the value of the cyanogen as only equal to that of ammonia, it would represent a yearly value of £1,500,000 sterling. It is not likely that such a valuable commodity will be wasted for a much longer time; for though the cyanogen compounds recovered by the gas-works could not be all sold as such, they could always be converted into ammonia salt. And if ammonia, which at present is considered the most likely raw material for the synthetic production of cyanides, could actually be commercially obtained from cyanide products recovered in the manufacture of coal gas, the methods which are based on the conversion of ammonia into cyanide would become obsolete.

In his admirable address, read before the International Congress of Applied Chemistry, Mr. Beilby shows that of the total number of cyanide factories more than one-half use at present ferrocyanide as a raw product, and convert it into cyanide by melting with metallic sodium; and it is this point which appears to me to be the weakest in his arguments. For the metallic sodium alone, not taking labour and inevitable loss into consideration, costs theoretically more than 1d. per pound to produce cyanide from ferrocyanide. The synthetic processes have, therefore, up to the present had to compete only with a process which is extremely expensive. If, therefore, it should be possible to reduce the expense of converting ferrocyanide into cyanide, the whole of these works, consisting of one-half of the total producing power, would be thrown out of competition; leaving barely sufficient producing power for the synthetic production of cyanide to cover the world's requirements, especially as the producing power estimated by Mr. Beilby does not give a guarantee that the product obtained is in all cases of commercial and economical value and a paying venture.

But, apart from these considerations, on which the future of the cyanide industry depends, it is well known to cyanide manufacturers that the purification of cyanides is one of the most difficult problems, and one which has never been solved satisfactorily. To purify, for instance, a cyanide containing sulphocyanides, ferrocyanides, sulphides, and carbonates, and similar impurities, is a task involving great expense and labour. On the other hand, it is extremely easy to convert an impure cyanide into a very pure ferrocyanide; so that if it were again possible to convert this ferrocyanide cheaply into pure cyanides, the extra price of converting the cyanide back into cyanides through ferrocyanide will still be the cheapest. These considerations have led me to give particular attention to the question whether it is not possible to design a process by which ferrocyanide can be cheaply converted into pure cyanide; and it is the outcome of my work on this subject which I beg to lay before you now.

One of the most interesting features of technical chemistry lies in the fact that some of the simplest processes which have been known for many years, and practised in the laboratory, have not been applied to work on a large scale, because for the time being no suitable machinery could be designed. One of these is the process of preparing prussic acid from ferrocyanide by distilling the latter with sulphuric acid. This observation was made by Scheele as far back as 1782. Since then the process has been studied by a great number of investigators; and it can only be attributed to the facts stated above, and to the apparently dangerous nature of the operation, that no one has carried this process through with a view to its technical application for the manufacture of cyanides. Another reason may be that it has been chiefly studied by pharmaceutical chemists with a view to producing an officinal solution of prussic acid, and without consideration as to expense. Thus the fact that only part of the available cyanogen was evolved as hydrocyanic acid did not appreciably affect their work. It became necessary to arrange the cycle of reactions in such a manner as to render the process absolutely quantitative before it became of technical utility.

Erlenmeyer, on studying the properties of the residue from the distillation of ferrocyanide with acid, found that the insoluble residue of potassium ferro-ferrocyanide could be qualitatively converted into ferrocyanide by heating with caustic potash, and gave the equation—

$$K_2Fe_2Cy_6 + 2KOH = K_4FeCy_6 + 2Fe\,(OH).$$

But on examining this reaction quantitatively, I found that it does not proceed on these lines. The yield was invariably far below theory; ranging only from 70 up to 80 per cent. of the ferrocyanide which should have been obtained. It was, therefore, out of the question that ferrocyanide could be recovered from Everitt's salt by boiling it in the ordinary way in a closed vessel with caustic soda, so as to produce ferrocyanide of soda and ferrous hydrate. But I found that if air was blown through the mass during boiling, so as to oxidize the ferrous hydrate produced to a higher state of oxidation, the ferrocyanide was recovered quantitatively; clearly showing that, whereas ferrous hydrate and ferrocyanide form an insoluble compound, a higher state of iron oxide and ferrocyanide do not form an insoluble compound. I have, moreover, found that, even working always under the same conditions, the yield of ferrocyanide is not absolutely constant, though it closely approaches one-half; but that whatever shortage or surplus of prussic acid is obtained is compensated by the larger or lesser quantity of ferrocyanide recovered, and that the process is an absolutely quantitative one.

The reactions upon which my process is based may, therefore, be briefly summed up in the following equations:—

$$(1)\ 2Na_4FeCy_6 + (3 + x)\,H_2SO_4 = 6HCy + Na_2Fe_2Cy_6 + 3Na_2SO_4 + xH_2SO,$$

$$(2)\ 3Na_2Fe_2Cy_6 + 6NaOH + yO = 3Na_4FeCy_6 + Fe_3O\,(3 + y) + 3H_2O,$$

$$(3)\ NaOH + HCy = NaCy + H_2O,$$

in which x represents any figure up to 3, and y any figure up to 1, or even exceeding it. Though the reactions do not take place absolutely quantitatively if we consider our equations separately, yet if we take the complete cycle of the three reactions the result is always quantitative. Thus, in a batch in which 133·1 lbs. of ferrocyanide of sodium were worked up, the sum of the cyanogen obtained as prussic acid and that recovered as ferrocyanide of sodium corresponded to 132·1 lbs. of ferrocyanide of sodium, showing an actual yield of 99·3 per cent.; and this loss of 0·7 per cent. even includes the loss in boiling to dryness.

As the full particulars of the process will be found in the English specification No. 36 of this year [Jan. 1, 1903], I need not go into the details of plant and of the strength of solutions of the materials. Broadly speaking, the necessary quantity of sulphuric acid of proper strength is run into a solution of ferrocyanide of sodium, and the evolved prussic acid is absorbed in caustic potash or caustic soda solution, or a mixture of both. The distillation is carried on in a partial vacuum, and the apparatus is arranged in such a manner that no accident could possibly occur to the workpeople. In the course of the manufacture of many tons of this product, I have had no accident, and not even a complaint of any inconvenience from the workpeople. The solution of cyanide obtained in the process is boiled down in a vacuum pan of special construction, and the product is delivered in the form of pellets, free from dust, and in a very pure form. I consider that these pellets should be of great advantage in the cyaniding of gold, as the workmen who have to dissolve them need not handle the cyanide at all when it is in that shape. A curious fact is also that these cyanide pellets, being practically a hydrated cyanide, dissolve more easily in water than the melted form. If it is desirable to produce the melted cyanide, this can be easily done by carrying the drying of the cyanide further, and then melting the powder thus obtained; but I consider it far

* See "JOURNAL," Vol. LXXXIII., p. 36.

preferable not to melt the cyanide, as I have never come across cyanide produced in that way which does not contain at least traces of sulphide, whereas cyanide made by the wet process is absolutely free from it.

It will be noticed from equation No. 1 that another bye-product—sulphate of soda—is produced during the reaction; and I have based on this fact a process which enables us to produce cyanide of sodium or potassium even more cheaply than in the process stated above. The equations representing this are as follows:—

$$(4)\ 2HCy + Ca(OH)_2 + Na_2SO_4 = 2NaCy + CaSO_4 + 2H_2O.$$

It can be seen from this equation, which is borne out by facts, that sulphate of soda and cyanide of calcium decompose easily into cyanide of sodium and sulphate of calcium. But the fact that sulphate of soda is obtained as a bye-product can be utilized in a different manner, which ultimately should be of great importance to the gold mines using cyanide.

It is well known among those conversant with the manufacture of cyanides, that the cost of packages and the cost of boiling down or melting form a heavy percentage of the total cost; and if these costs could be saved, and if cyanide could be produced in solution by the mines themselves on the spot, where the cyanide is to be used for gold extraction, the saving to the user would be very considerable. At the first glance, it would appear that the method which I discussed last—that of using the recovered sulphate of soda in conjunction with lime for the production of cyanide—would fulfil these requirements; but that is not so. In nearly every locality where cyanide is used for gold extraction, the cost of sulphuric acid would be prohibitive; and though lime and coal might be found cheap enough, the extra cost of sulphuric acid would nullify every other saving. But where the cost of transport is heavy, there should be no great difficulties in the way of electrolyzing the recovered sulphate of soda on the spot, and reconverting it into caustic soda and sulphuric acid, so that in the end the cost price of cyanide at the mines would not be much higher than the cost price of the ferrocyanide in proportion to their respective equivalents.

To sum up, it appears probable that the outcome of the reactions I have laid before you may affect other industries besides the manufacture of cyanides. As regards that industry, it is possible that in the course of time the gold mines may produce their own cyanide in solution, either in each mine or in convenient centres from which a number of mines could be supplied. It should certainly supersede the processes in which metallic sodium is used for the conversion of ferrocyanide into cyanide. But the process I have described should be of particular interest to gas-works, as it opens up a question which, to my knowledge, has never been approached—viz., the technical conversion of prussic acid into ammonia. As far back as 1896, Mr. Charles Hunt considered that cyanide could be obtained cheaper from gas than by any synthetic method.* But the methods for recovering these compounds from crude gas advocated by Knublauch, Foulis, Wilton, Bueb, and others have not received the attention in this country which they deserve. This, no doubt, is to some extent due to the commercial reason that if the gas-works were to recover all the cyanogen as ferrocyanide, there would be no sale for the greater part of that product. But the fact that I have shown it to be possible to obtain the cyanogen from ferrocyanides quantitatively, and without the least danger, as prussic acid, and the property of prussic acid of being easily converted into ammonia and formic acid, appear to me to put a different complexion on the recovery of cyanogen from gas, as what could not be sold as cyanide or ferrocyanide could be sold in the form of ammonia salts, and as formic acid.

Discussion.

Dr. COLMAN remarked that it appeared to him, on looking at the equations, that it was by no means certain that the process would be cheaper than the one in which sodium was used. Dr. Grossmann started with Na_4FeCy_6, but sacrificed the whole of the Na_4 by acting on it with sulphuric acid. He was neglecting now the suggestion that the resulting sodium sulphate could be afterwards electrolyzed, and the sulphuric acid and caustic soda recovered. A portion of the Na_4FeCy_6 was converted into $Na_2Fe_2Cy_6$. To reconvert this into Na_4FeCy_6, it was necessary to use two more molecules of caustic soda. Altogether six molecules were used, and then another six were required to convert the prussic acid into sodium cyanide; bringing the total up to 12 molecules of caustic soda in place of two atoms of sodium. Though caustic soda was considerably cheaper than sodium, it would require eight times as much. Further, in the conversion of sodium ferrocyanide into cyanide with metallic sodium, there was no solution to be evaporated, so that the fuel cost of Dr. Grossmann's process must come out higher. Of course, there was always a loss of metallic sodium in the manufacture of cyanide. He did not know how much, but that must be taken into account. He did not gather whether the yield of sodium cyanide from the hydrocyanic acid after evaporation was quantitative.

Dr. GROSSMANN said there was no loss of cyanide during evaporation.

Dr. COLMAN pointed out that the author had stated that no process could be considered in connection with gas-works other than the ferrocyanide one; and it was quite true that up to the present the greatest quantity of the cyanides in gas had been recovered in the form of ferrocyanide. This, however, was mainly due to the fact that the demand for ferrocyanide was greater than that for sulphocyanide. There was no reason whatever why sulphocyanides could not be obtained from coal gas equally well, and, he thought, more cheaply than by any process at present in use for making ferrocyanides. Whether it would be better to manufacture ferrocyanides or sulphocyanides, would depend on the prices obtainable for the two products; and this in turn would be determined mainly by the relative cost of converting these into cyanide.

Mr. A. G. BLOXAM regretted that Dr. Grossmann had not considered more closely the question of recovering cyanogen from coal gas in the form of sulphocyanide. Eight or nine years ago, he made a series of experiments at the South Metropolitan Gas-Works, and found that by passing the gas after it left the ammonia scrubbers through polysulphides, sulphocyanide was formed without any loss whatever. All the cyanogen was recovered as sulphocyanide, and the separation of this compound from the remaining polysulphide, if any such remained, was quite easy. Then the difficulty came in as to whether there was any market for sulphocyanide. He came to the conclusion at that time that there was not; and if anything was to be done it must be by way of winning the hydrocyanic acid directly from the sulphocyanide. But since then much work had been done on the oxidation of sulphocyanides, particularly with nitric acid; and doubtless in the near future Raschen's process, or some modification of it, would enable them to recover the whole, or practically the whole, of the hydrocyanic acid from the sulphocyanide. The process to which he referred was the oxidation of sulphocyanides by nitric acid, and the recovery of oxides of nitrogen as nitric acid, which was returned automatically to the retort. Unless Dr. Grossmann's process were a continuous one, there would be difficulties in getting it adopted. In this case, it seemed that they first had to distil with sulphuric acid, and then treat with caustic soda, and so separate the ferrocyanide from the other matters formed by that reaction, and then to distil again with sulphuric acid, so that there did not seem much chance of making the process continuous. What degree of purity was obtained in the final product? and, in evaporating down, was all the prussic acid obtained? The author said he got it all. But was it not necessary to use a large excess of caustic soda to retain it, so that ultimately there would be a mixture of caustic soda and cyanide instead of the cyanide of 98 per cent. obtainable by other processes?

Mr. J. C. RICHARDSON inquired, if the author proposed to introduce electrolysis for the recovery of the sodium at the end of the process, why he did not introduce it at the beginning, and so effect the reduction of the salt. With regard to the first reaction, which was said to be a distillation under reduced pressure, had the author applied pressure and obtained any altered or more efficient results? It seemed rather a roundabout way to arrive at the same results as were already obtained by metallic sodium, the production of which he believed could be done now very economically by means of cheap water power. What electrolytes would be used for the recovery of the sodium, and what apparatus? With regard to the absorption of hydrocyanic acid by means of alkali, and the importance of excluding the presence of sulphides, probably if the alkali were an electrolytic product the sulphides would be reduced to a minimum. Had the author tried the result of blowing in other gases—carbon dioxide, for example—instead of air?

Dr. H. P. STEVENS asked if Dr. Grossmann had tried distilling the cyanide with an acid in the presence of an oxidizing agent. On one occasion he had tried this experiment with a nitrate in solution in a somewhat large quantity, and the distillation was carried almost far enough to produce red fumes. The whole of the cyanide was in the distillate as hydrocyanic acid. He thought it possible that quite a small quantity of an oxidizing agent—perhaps a less expensive one than nitric acid—might be used, and in this way the whole of the cyanogen obtained as hydrocyanic acid in one operation.

Dr. J. LEWKOWITSCH asked what strength of sulphuric acid was used, because he thought the hydrocyanic acid would come over considerably diluted with steam. Would it be of any advantage to get some of the hydrocyanic acid as a liquid?

The CHAIRMAN (Mr. Walter F. Reid) said that some of the mines in the Transvaal were almost entirely dependent on the use of cyanides for their profits; and therefore the production of cheap cyanides was a very good thing for them, even if not for the manufacturers. There were two legitimate ways of altering prices—either by diminishing production or increasing consumption; and the latter alternative appeared in this case to be the most hopeful. There were many uses for cheap cyanide which would materially increase the demand, and so counterbalance the extra production with depressed prices. In the United States, which was practically excluded from our manufacturers by a tariff wall, there was a large consumption of cyanide for agricultural purposes. He was informed that the extensive orange industry in the Southern States and in California was threatened almost with annihilation by a parasitic scale, but which was now completely destroyed in well-managed plantations by cyanide. A tent was placed over each tree, and within it hydro-

* See "JOURNAL," Vol. LXVII., p. 1090.

cyanic acid was evolved. Some of our farmers who complained about blight in hops and similar crops might follow suit. Another thing that rather hampered our manufacturers with regard to potassium cyanide was that potash had come from abroad—Germany having practically the monopoly of it—and he did not see how they were to avoid that. Sodium cyanide, of course, was different. With regard to the use of cyanides for other purposes in connection with organic chemistry, Dr. Grossmann had mentioned formic acid. They, however, did not know what use could be made of this acid, because it had never been cheap enough. If it could be produced cheaply, there would probably be a great opening for it, in the same way as with lactic acid, which was now being used for a number of purposes. Those who were engaged in the cyanide industry should do all they could to develop these openings; but in any case the use of cheap cyanide was a very great advance for humanity.

Dr. GROSSMANN, in reply, said that he did not know whether Dr. Colman was quite correct in stating that no solutions had to be evaporated. There was no doubt there was a considerable loss of metallic sodium, which was a far greater expense than evaporation of comparatively strong solutions. The iron residues had to be separated from the melt in the melting process, so that more than a quantitative amount of metallic sodium was used, and a certain amount of cyanide of sodium or potassium which adhered to those iron residues had to be recovered. It was not so clear and simple a process on the large scale as it looked on paper. The claim he made for his process was that it was exactly the reverse. It was a far simpler system on the large scale than it appeared on paper. Dr. Colman also said that up to the present time most of the cyanide which had been recovered from gas had been in the form of ferrocyanide, but that the gas-works, if they liked, and had an outlet for it, could have made it into sulphocyanide. He could not enter into a discussion of this point. He did not profess to be a gas manufacturer. But on reading the literature, it seemed that the principal processes used now on the Continent and in this country in gas-works, of which results had been published, dealt with the recovery of cyanogen from gas in such a manner that chiefly the ferrocyanide was recovered; and in these processes 95 per cent. of the cyanogen was in the shape of the ferrocyanides, and only about 5 per cent. as sulphocyanides. In the old process of recovering cyanides, he always understood the sulphocyanide was a very great nuisance, apart from being unsaleable. He was quite aware of Raschen's process, which was a most ingenious, and, as far as he could judge, a most successful one. At the same time, Raschen must use sulphuric acid, and he also used nitric acid, as well as caustic soda or caustic lime; so that he could not see that it altered anything. It simply became a question for the gas-works to choose between two methods—one giving them cyanogen in a beautifully crystallized form, which would keep for any length of time, which was not hygroscopic, and which could be transported and might easily be worked up; and the other yielding troublesome substances like the sulphocyanides, which were hygroscopic and difficult to crystallize. He did not know Mr. Bloxam's process for the recovery of the cyanogen as sulphocyanogen, as it had not been published; and he must confess that if he had to choose between two methods—one giving him a crystallizable salt, and another giving him the sulphocyanides, of which he knew all the disadvantages—he should prefer the ferrocyanide. It would, of course, become a question of cheapness and efficiency with the gas-works. His process could be made continuous in a very simple manner. There was no difficulty about it on the large scale. It need not be made absolutely continuous, for it could be stopped at a certain time, and the product worked up afterwards in batches. Mr. Bloxam also asked him the degree of purity obtained in the finished cyanide; and to this he could only say that every batch was tested, and there was a very slight loss of hydrocyanic acid in evaporation. Taking everything into account, all the losses came to 0·7 per cent. The process had been tested very carefully, and the results were checked by others more competent in analytical work than himself. There was absolutely no impurity in the cyanide except water, if that could be termed an impurity. In making sodium cyanide, they boiled down to the point when the salt was in such a state of hydration that it tested 98 to 100 per cent., calculated on potassium cyanide. If they wanted to make the so-called commercial cyanide of potassium (which was not cyanide of potassium, as they all knew), they mixed a judicious quantity of potassium cyanide with the sodium cyanide, and stopped at the point when the product tested was 98 per cent. It could have no impurities except those which might get in by decomposition in the boiling down, and that with proper apparatus could be avoided. Mr. Richardson asked why he did not electrolyze at first. Because it would not pay in this country to make caustic soda and sulphuric acid by electrolyzing the sulphate of soda. With regard to the blowing in of carbon dioxide instead of air, he did not see why he should not use the cheapest material; consequently he always used air. Then a question was asked as to whether he had tried to work under pressure. He could only say that anyone who wished to make prussic acid under pressure would find it an extremely dangerous undertaking. As to distilling in the presence of oxidizing agents, particularly nitric acid, which was referred to by Dr. Stevens, if a process could be obtained which would do this, it might have some advantages, or it might not. The great advantage of working with sulphuric acid was that there was no difficulty whatever with regard to plant. Lead could be used, as it was not attacked by prussic acid; iron could also be used, except in presence of sulphuric acid; and there was no danger of any explosive compounds being formed. Nitric acid or nitrates were substances which he greatly objected to in conjunction with cyanides. The strength of the acid he used was about 20 per cent. Whether or not hydrocyanic acid as a liquid would be useful, he could hardly say. It certainly could not be employed for the extraction of gold, and he did not think it would be of any use, except that it could be easily converted into ammonia and formic acid.

WOOD GAS FOR POWER PURPOSES.

At the Meeting of the Iron and Steel Institute held in the summer of 1902, Dr. James Douglas, of New York, submitted a paper on the working of a gas-producer with wood fuel, either for driving engines or for metallurgical purposes. The author illustrated his subject by giving a description of a power-gas plant in use in Mexico; and a few particulars were reproduced in our columns at the time. The plant in question was that of the Moctezuma Copper Company at Nacozari, Sonora, Mexico; and it was further described in a paper read before the American Institute of Mining Engineers, at their meeting last October in New York, by Mr. John Langton, of that city. A reprint of the paper has been forwarded to us, from which we are enabled to furnish additional information in regard to the installation.

In determining what kind of power should be adopted for the Company's works, certain considerations, imposed by local conditions, had to be taken into account. Though during the greater part of the year the water supply was abundant for all purposes, it dwindled rapidly when the dry season set in. It was evident, therefore, that the capacity of the works would be limited for some two months of the year by the small quantity of water available. The total force contemplated to begin with was from 500 to 600 horse power; and compound condensing steam-engines of moderate capacity would, it was considered, be the highest grade of steam apparatus appropriate to the size and location of the plant. Including shrinkage, 3 lbs. of coal per brake horse-power-hour would be a very good result to obtain; but, in comparison therewith, 1½ lbs. of coal was obtainable with engines using producer gas. Moreover, besides the greatly reduced fuel cost, gas power offered very important additional advantages in facilitating the continuous operation of the works at their full capacity, by lowering the consumption of water in the dry season, reducing the stock of fuel for tiding over periods of interrupted transport, and lessening the average quantity of daily freight.

The economy of fuel promised by gas-engines had led to their use in supplying all the power needed for a small electrolytic refining plant operated by the Copper Queen Consolidated Mining Company, with the view of giving them a practical trial which would test their mechanical suitability for the exacting conditions and continuous use incidental to the power service of a copper-reduction works. When it became necessary to decide the question of power for Nacozari, more than a year's experience of this plant had led to the conclusion that a good gas-engine in proper condition was a simple and reliable prime mover, requiring no better class of attendance than steam-engines of the same size; and, further, that this condition could be easily maintained by periodical inspection and cleaning, for which provision must be made. On consideration of the whole question, giving due weight to the facts briefly indicated above, it was decided that properly selected gas-engines, in a suitably arranged power plant, would be well adapted to the general conditions at Nacozari, and would result in a fuel economy which was there particularly valuable, in view of the limited local supply of wood and the then necessarily high price of coal.

The power house contains eight single-cylinder Crossley gas-engines, 18½ inches diameter and with 24-inch stroke, running at 200 revolutions per minute. They are of the four-cycle type, with hit-and-miss governor; and each is belted to a 65-kilowatt direct-current generator. The generators are run in parallel, and deliver to the main switchboard in the power-house, from which the current is distributed at 250 volts to some forty different motors scattered about the works, ranging in size from 5 to 175 horse power. Arc and incandescent lights are operated from the same circuit as the motors. The engines are started by compressed air—a method which has been found very simple and convenient. One air reservoir of 90 cubic feet capacity is employed, which is kept full of air at about 90 lbs. pressure by the intermittent use of a motor-driven air-compressor, 8 inches diameter and 6-inch stroke, running at about 60 revolutions per minute. A steam-driven locomotive air-pump was used in starting the plant; and, supplied by the gas-plant boiler, it remains as a stand-by to the compressor. Opposite each engine is a tank, 11 ft. by 18 ft., and 3 feet deep, which is placed outside the power-house on a level 20 feet above the engine. Pipes from the inlet and outlet of the engine water-jacket are connected to the bottom of the tank; and the heat of the cylinder automatically keeps the jacket water in circulation. The flat form of tank gives sufficient surface to cool the water by radiation and evaporation.

The gas-producers are the Loomis-Pettibone, which have been described in the "JOURNAL" on several occasions—the last being

on Nov. 24, 1903. They are 6 ft. 9 in. internal diameter; and when filled with coal to the highest level practicable, they hold a charge 8 feet deep. A generating set consists of two producers and a boiler; and at Nacozari there are two sets, which are alternately used. A holder of 15,000 cubic feet capacity receives the gas which is to be used in the engines, and gives the necessary elastic storage between the production in the gas-house and the consumption in the power-house. A second holder of 5000 cubic feet capacity is used to receive, and to keep separate, the water gas made by the intermittent runs. By means of valves, the gas is delivered to either of the holders, or is allowed to escape into the air. In case the whole plant is shut down, the holder is left full of gas, which gives sufficient power to start the plant and run it until it is again producing gas. The plant has been operated with wood as well as with anthracite and bituminous coal. But it is the former material which constitutes the novel feature; and therefore the portion of Mr. Langton's paper dealing with it possesses the most interest. From this, we take the following particulars.

The introducers of the wood-gas process had no recorded experience to guide them; but with the desire to utilize as far as possible the limited local supply of wood, the plant was selected with the object, among other things, of determining the advisability of using, if not wood alone, at least a considerable admixture of wood with bituminous coal. The power plant was started on July 31, 1900, with coal. For some months afterwards there was no convenient opportunity to experiment with wood; and it was not till Feb. 4, 1901, that the first trial of this material alone was made.

The most obvious difficulty to be feared arose from the large proportion of condensable distillates yielded by wood, and the danger that some portion of these might be imperfectly fixed in passing through the producer. The trouble from tar deposited in the gas apparatus and pipes would be serious, and even a small quantity of tar in the gas itself is a fertile source of trouble at the engine-valves. Unless a permanent gas could be made from wood, this fuel would be unavailable. The first care, therefore, was to ensure that there should be a bed of charcoal on the grate sufficient to form an adequate fixing zone. To obtain this, the producers were filled about 5 feet deep with cordwood, sawn in blocks about 6 inches long, and the contents blown with a slow fire for four or five hours before the gas was turned into the holder. As it proved, the gas was sent into the holder too soon. At first, it contained some tar; and it was not until after about three hours' operation that the charcoal accumulated in sufficient quantity, so that fixed permanent gases were delivered.

The preliminary trial lasted more than twelve hours, until the supply of sawn wood was exhausted. As was expected, upon drawing the fires, a considerable quantity of charcoal was obtained, which was available for use as a bed in starting the succeeding fires. But before the next trial was made, it was suggested that for this purpose coke would be better than charcoal. Though in the first trial charcoal in sufficient quantity had proved effective in fixing all the gases, it was felt, rightly or wrongly, that the coke would be a stouter and more reliable screen than the comparatively frail charcoal; and, in particular, that, as a reinforcement to the charcoal formed above it by the action of the fire, it would effectually safeguard against the possible danger that temporary holes might be burned through the charcoal, by which tar vapours might escape from the producer but for the fixing action of the more enduring coke. However correct this opinion might be, a coke bed would certainly be an additional precaution against the serious trouble that might result from delivering imperfectly fixed gases to the holder, and would give to the operator great relief from anxiety on this score. It was therefore thought best, without further experiment, to use coke, which was available at Nacozari; and the practice has been continued ever since. The experience at Nacozari, therefore, does not determine whether or not it would be safe to dispense with the use of coke.

The second trial, beginning on March 14, 1901, was carried on for 66 hours with perfect success; and after a third trial of some 36 hours' duration, made a few days later, had proved that there was no difficulty in repeating the previous excellent results, measures were taken to gather a supply of wood sufficient to operate the plant with wood gas exclusively.

The wood used for the first trial was sawn needlessly small. For the second trial, the bulk of the wood was in half lengths of cordwood, with about 10 per cent. whole lengths and 10 per cent. short blocks. The producers at Nacozari are too small to use whole-length cordwood alone. Half-lengths are satisfactory for fuel; but small sticks may be quickly sawn into 6-inch lengths, giving a stock of small blocks for filling holes or quickly building up the fires. The wood is cut for packing on burros, and is little more than 3 feet long. There is also a large proportion of crooked sticks. As actually piled in the yard and paid for, it weighs about 2200 lbs. per cord. The wood used is principally scrub white oak, with about 10 per cent. of ash, and having an average moisture of 19·76 per cent. Ordinarily, no top steam is used in making wood gas; the contained moisture in the wood taking its place. Drier wood, without top steam, means somewhat more frequent water-gas runs. With very wet wood, the fires do not become hot enough to make good gas. About 3 feet depth of coke is put in to form the precautionary bed; and the greater part of it is recovered.

The composition of producer gas made from anthracite and bituminous coal and wood is shown in the following table (the figures being averages):—

Components.	Anthracite Coal.	Bituminous Coal.	Wood.
CO	21·60	20·32	13·27
H	12·68	13·08	20·97
CH_4	1·86	2·35	2·61
CnH_2n	0·18	0·20	0·28
CO_2	8·10	7·66	15·96
O	0·20	0·04	0·11
N	55·38	55·35	46·80
Calorific value, B.T.U. per cubic foot, at 60° Fahr. and 29·9 inches barometric pressure	131·10	133·47	140·22

It will be seen that the composition of the coal gases is practically the same, but differs materially from that of gas made from wood. The calorific power of all three gases, however, remains constant. In the following table is shown the typical composition (volumes per cent.) of coal gas and wood gas:—

Components.	Coal Gas.	Wood Gas.
CO	20·0	14·0
H	14·0	20·0
CH_4	2·0	2·0
CnH_2n	0·2	0·2
CO_2	8·2	16·0
O	0·1	0·1
N	55·5	47·7
Calorific value in B.T.U. per cubic foot	132·0	132·0

As compared with coal gas, the proportions of carbon monoxide and hydrogen in wood gas are reversed, and the percentage of carbon dioxide is doubled. With the typical compositions given above, the wood gas shows less tendency than the coal gas to preignition in the engines. This effect appears due to the large proportion of carbon dioxide; but the reason is not apparent.

From a number of tabulated working results compiled from records kept by Dr. A. Sandberg, the Metallurgist at the works, and Mr. G. M. Douglas, the Engineer-in-Charge, we take the following figures: In a six-day run (138 hours) of one generating set, the average electrical horse power, read at the switchboard, was 440·7; being equivalent to 489 brake horse power, allowing 90 per cent. efficiency in the generator. In the gas-house, the average electrical horse power used was 16·5; the vacuum at the exhauster being 24·2 inches. The following figures are the averages obtained with a six-day run with one generating set:—

	Gas Supplied to Engines.	Water Gas.
CO	13·86	9·86
H	19·10	54·14
CH_4	2·39	3·45
CnH_2n	0·35	0·46
CO_2	14·90	21·30
O	0·35	0·26
N	49·04	10·61
Calorific value in B.T.U. per cubic foot (60° Fahr.; 29·9 in. bar.)	135·22*	246·88

* The actual average calorific value of the gas, at 80° Fahr. and 26·4 inches of the barometer, was 114·6 B.T.U.

The figures given below show the general results of a run of one set of the generating plant extending over six days:—

Oil used in engine cylinders		24·0 gals.
Do. in engine bearings		22·5 ,,
Coke put into generators	5,740 lbs.	
Coke removed fit for use again	4,642 ,,	
Total coke consumed		1,098 lbs.
Wood used until fires were ready	10,000 lbs.*	
Do. while making gas	190,750 ,,	
Total wood consumed		200,750 lbs.
Total brake horse-power hours		67,482
Wood consumed per hour		2·97 lbs.
Number of water-gas runs made		203
Average interval between runs		40 min.
Steam used (approximately estimated) in making water gas (at 125 lbs. pressure)		66,000 lbs.
Blown away at safety-valve (at 130 lbs. pressure)		14,500 ,,
Water blown from boiler at blow-off cock		3,500 ,,
Total feed water (av. temp. 78° Fahr.)		84,000 lbs.
Water passed through scrubber per hour		3,800 gals.
Average inlet temperature		72·5° Fahr.
Average outlet temperature		107·6° ,,
Sensible heat extracted in scrubber per hour		1,111,500 B.T.U.

* The weights of wood are commercial figures, including shrinkage, charged against the plant on the books.

Indicator diagrams are given showing the work for one day of three of the gas-engines of the power plant; and the paper closes with some general remarks on the use of gas-engines.

Expenses of Municipal Councillors and Officials as Delegates.—On the occasion of the recent audit of the accounts of the Tottenham Urban District Council, the Auditor disallowed a sum of £20 10s., expenses incurred by three members in attending meetings of the Institute of Public Health at Exeter in August last; the reason given being that it was not a "conference of local authorities." Three members were also surcharged with a sum of £10 10s. paid to the Inspector of Nuisances for expenses incurred in attending the Sanitary Congress at Manchester.

AN IMPROVED GAS-BRACKET.

Messrs. Ingram and Kemp, Limited, of Birmingham, have produced a full range of swivel-joint gas-brackets made with their protected solid-hot joints, an illustration of which is given below. After having had over two years' experience in their new method of making these brackets, they feel assured of a successful future for this class of work. We have examined a sample of the brackets; and the excellence of the joints is undoubted. They are bored from the solid rod, with the result that a long bearing in the barrel is given. Moreover, the joints are free from sand holes; and there is also no chance of loose sand (left in the casting from the core) working down into the bearings. The swivels

and thumb-plugs work free and smoothly, and are gas-tight without grease, so that the brackets are well adapted for use with acetylene. Although these brackets are lighter in appearance compared with cast joints, they are said to be very much stronger, owing to the toughness of metal from which they are made, and the gas-way drillings being only of sufficient size to allow for the passage of gas. Another feature is a steel-wire pin, screwed tightly into the body, in place of the brass pin pushed into the plug, which is liable to fall out. The brackets should commend themselves to gas managers, particularly in connection with slot-meter installations—more especially as the price compares favourably with that of brackets made from castings.

The Manchester and District Junior Gas Association will meet on Saturday next, when a visit will be paid to the Oldham Corporation Gas-Works at Higginshaw.

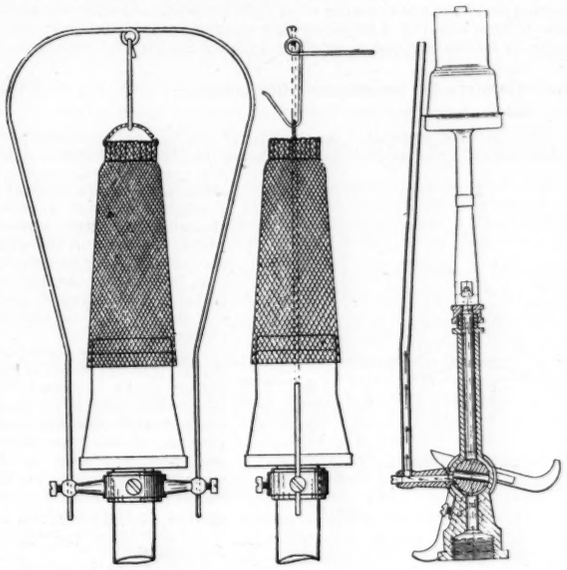
Prevention of Explosions while Clearing Mains of Air.—Mr. J. A. Myers, of New York, in a letter written to the Editors of the "American Gaslight Journal," calls attention to the fact that many explosions have occurred from the application of a light to a jet of gas issuing from apparatus and mains, during the operation of clearing them of air and filling them with gas, to determine if they have been freed from the former. He points out that this risk can be entirely avoided by a simple and absolutely safe experiment performed by the aid of articles in daily use; and he explains the method as follows: "Half fill a bucket with water, and attach a section of gas-hose to the jet coupled to a cock from the main or apparatus to be purged. Open the cock, allowing the mixture of air and gas to pass through the hose for a few seconds. Submerge an ordinary drinking-glass in the water (filling it with the latter), and turn it upside down, holding it by the bottom, keeping its mouth under the water. Place the end of the hose in the water under the glass, and in a few seconds the water will be displaced by the gaseous mixture. Close the cock, and raise the glass completely out of the water, still holding it upside down. To this sample of the mixture apply a light. If it burns with a white flame, it is all gas; if with a blue flame, it is still mixed with air; if it explodes, you have saved a works from an explosion of unknown consequences."

Austrian Petroleum Exports.—The question of the position of the Austrian petroleum export trade has now reached an interesting stage as a result of the competition between the Deutsche Bank and the Standard Oil Company on the one hand for the control of the exports to Germany and Switzerland, and the efforts of the Austrian refineries to form an independent export organization on the other. In this connection, the Vienna Correspondent of the Berlin "Tageblatt" states that a fresh conference is to be held in a few days for the purpose of discussing the organization of the export trade to Germany. At the previous conference, the principle of forming an export company for supplying oil to Germany and Switzerland was approved. The shares are to be taken up by the petroleum suppliers; and the working capital is to be provided by the Austrian Credit Anstalt and the Hungarian Credit Bank, who wish to secure a considerable influence in the export trade in petroleum. A petition has been presented to the Government asking for sanction to form the Company; and the refineries undertake to supply the whole of their surplus quantity to the new concern at a definite rate, dependent upon the price in the German market. Apart from this scheme, negotiations are pending which have as their object the conclusion of an agreement between the Austro-Hungarian petroleum exporters and the Standard Oil Company. The representatives of the German-American (Standard) Oil Company have placed before the Austrian interests definite proposals for the establishment of a Syndicate in Germany; and it is now a question as to whether these conditions shall be accepted. According to the statements of the Americans, they are not prepared, under any circumstances, to make any further concessions. The prospect exists that an agreement will be arrived at; the more so as a connection between the Russian Naphtha Importation Company for Germany and the new Export Association is said to be assured.

REGISTER OF PATENTS.

Anti-Vibrators and Bye-Pass Taps for Incandescent Gas-Burners.—Moeller, J., of Victoria Street, S.W. Nos. 27,336-37; Dec. 11, 1902.

The anti-vibrator (as shown) consists of an adjustable double wire support with balance tail-hooks to hold the mantle. Into the eye-shaped loop at the top is hung loosely a wire hook that has a projecting end long enough to adjust its balance so as to keep the mantle over the centre of the burner. The side supports are fixed in holes provided in the gallery part of the burner, or there is a collar (with holes for set-screws to take up the supports) made to slide up and down the bunsen part of the burner, which can be fixed in any position by a set-screw, so as to allow of the raising or lowering of the mantle according to the longer or shorter bunsen flame or if the mantle has lost its length through shrinking. The wire hook swinging loosely, any vibration or shock to the burner is partly broken by the support itself, but is entirely counteracted by the slight swinging action the hook in the loop is allowed to perform.



The bye-pass lantern tap (also shown) consists of a short arm cast horizontally from the right-hand side of the plug case with a gas-way through it in direct communication with the hole through the plug proper when the gas is shut off. The bye-pass tube is carried upwards from the arm to the top of the burner. There is a groove cut near the hole of the plug close to the side of the arm—made D-shaped, so that a leak of gas finds its way through the side arm and up to the top of the bye-pass tube. The leak is, however, stopped or shut off when the hole in the plug is vertical or the gas is full on to the burner; but it constitutes the bye-pass flame when the burner is shut off. When the tap is turned on, the leak increases, and so lengthens the bye-pass flame; and this continues until the burner is lighted. When full on, the leak or bye-pass flame is cut off, and remains so until the action of the plug is reversed, to put out the light. The leak or bye-pass then comes into action, and ignites itself from the flame of the burner and keeps so until the tap is turned on again. There is a set-screw on the lever of the plug in the tap body, which regulates the distance between itself and the corresponding lug on the tap body—so adjusting the size of the bye-pass flame or the extent of the leak as may be desired.

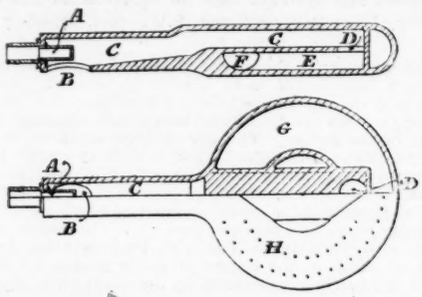
Gas Lighting and Heating Apparatus.—Hinman, C. W., of Boston, U.S.A. No. 27,736; Dec. 16, 1902.

This invention (relating to gas-lighting apparatus of the type employing a mixture of air and gas—the gas used being ordinary illuminating gas) has for its objects: (1) To improve the construction of the machine to the end that measured volumes of air and gas are simultaneously delivered by a suitable pump to a holder adapted to contain a variable volume of mixed air and gas under constant pressure and deliver it to a burner; (2) to improve the construction of the pump, whereby it is especially adapted for simultaneously delivering measured volumes of air and gas to the holder; also (3) to provide means for regulating the delivery of air and gas from the pump to the holder, which is controlled or operated by the volume of mixed air and gas in the holder.

Gas-Stove Burners.—Billington, W. J., of St. Michael Street, and Morris, E. G., of Chiswell Street, E.C. No. 793; Jan. 13, 1903.

These burners consist of two parallel mixing-chambers communicating with one or more combustion chambers. In the arrangement shown next page, the gas issuing from the nozzle A draws in air at the opening B, and commingles with it. It then passes along the top chamber C, descends at D into a larger chamber E, and returns along this in a backward motion to F. It then opens into the larger chambers G. These carry the burner perforations or nozzles H at their upper part. Here the gas is ignited, having become thoroughly mixed in the chambers C and E, and the mixture expanding before it reaches its burning point. All back-flash to the gas-nipple A is said to

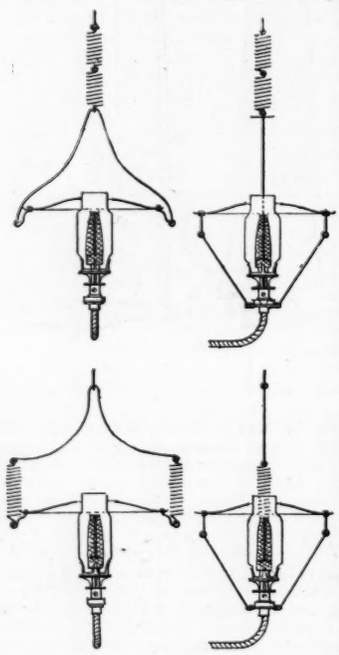
be prevented by reason of a column of mixture in the chamber C opening into the chamber E at D and returning sharply in a backward motion. This drives and mixes with the volume of air lying still in the burner (which is now created into an explosive mixture) to the



point of ignition H; but by the time it reaches this point, there is following on in the top chamber (C) a right proportioned mixture, and in the bottom one (E) a large enough quantity "to provide an ample cushion for the purpose of resisting the back-flash to the gas-nipple."

Anti-Vibrators for Incandescent Gas-Lamps.—Thorp, F., of Whitefield. No. 2430; Feb. 2, 1903.

The patentee proposes to fix the base of the burner to a centre plate attached to two wires on opposite sides of the plates—the wires extending upwards at an angle of about 30° from the vertical to a height of about 3 inches above the top of the burner, where the ends of the wires are jointed with, and engage into, hooks or loops attached to the underside (and on opposite diameters) of an annular reflector.



From opposite diameters, and at right angles to the last-named hooks or loops, are two other hooks or loops projecting downwards about 2 inches, to which are jointed the ends of a wire carried vertically upwards to the height of the reflector, and then at an angle of about 30° to the point of suspension of the system.

The system is suspended preferably to two helical metallic springs in tandem, each about 2 inches in diameter and about ten coils, capable of stretching to about three times their closed length by the attached weight. The gas supply is preferably led to the base of a burner by flexible metallic tubing of not less length than about one foot.

The accompanying illustration shows two variations of construction, in vertical section; and these are self-explanatory.

Removing Suspended Matter from Gases.—Dick, F. W., of Rotherham. No. 4568; Feb. 26, 1903.

This invention relates to the cleansing of gases from grit and the like, carried in suspension—such, for example, as the gases from a blast-furnace—the object being to provide "means for cleansing gases from suspended matter, which shall be free from mechanically moving parts, cheap to construct, and require a minimum outlay for its upkeep." The proposal is to employ a series of vertical grids or baffles arranged in the lower part of the flue or main conveying the gases to be cleaned, and adapted (owing to the action of gravity and to the eddies of the gases as they pass through the flue) to catch and retain the bulk of the heavier impurities contained in the gases. A space under the grids or baffles, and in which there is no gas current, forms a quiescent place in which the dust can settle and remain at rest. The invention also consists in applying special means for removing the material which collects in the flue.

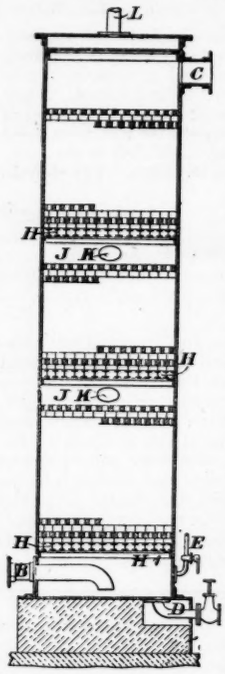
Incandescent Gas-Burners.—Siegenberg, L., jun., of Highbury, N. No. 22,392; Oct. 16, 1903.

This invention has reference to a method by which incandescent gas-burners can be fixed on to—and, when required, removed from—ordinary gas-burners in lieu of (as at present necessary) screwing the incandescent burners upon the gas-brackets, and in some cases adapting them for the purpose.

The patentee provides upon the lower end of the body of the incandescent burner a preferably tubular extension either tapered outwardly, or formed of one or more parts, or split, for adapting it for gas-tight connection on simply placing it over or upon an ordinary gas-burner. The body of the incandescent burner (to avoid the need of excessive length) may be provided with baffle-plates, discs, or the like, to obviate the possibility of the burner lighting back when lit.

Washing and (or) Cooling Towers.—Duff, A. B., of Pittsburgh, U.S.A., No. 24,262; Nov. 9, 1903.

This invention, relating to gas or air washing or cooling towers, has for its object to provide improvements in connection with the packing or filtering medium employed, so that the tower shall be rendered more efficient for the purpose required, while the packing itself will also be more readily got at for repair or renewal.



In towers as usually constructed for washing or cooling fuel gases by the direct application of water, there is (says the patentee) usually one pile of brickwork, tiles, coke, or other packing or filtering materials fitted into the tower in one consecutive or continuous mass. Such a system of packing, however, causes the lower layers of the materials to sustain the superimcumbent mass; so that the continued action of heat or moisture, or both, results in a softening or disintegration of the packing material, and a consequent collapse of the whole—blocking the apparatus and obstructing the circulation of the gas and water through it. As this is most likely to happen near the bottom of the tower, where the greater weight or pressure is on the packing materials, the whole of the packing has to be removed from the tower in order to obtain access to the lower part. In towers with continuous packing, the gases and water enter among the packing and flow as nearly as possible in direct upward and downward lines, so that should gas enter at a part of the packing where the water distribution through any cause is defective, the gas may escape without either being cooled or washed. This invention provides the means requisite for preventing the complete collapse of the packing, and renders it possible to remove the packing in sections or parts—one part being removed without interfering with the others; and should any part become choked, it can be readily got at for repairs or renewal. Provision is also made for the collection and mixing and redistribution of the gas and water or liquor at intervals in their upward or downward course. This, it is pointed out, is most important in towers (for example) where ammonia is absorbed from coal gases by acid solutions, as, on account of the proportion of ammonia being very minute, any imperfection in the proper distribution of gas and liquor, arising from possible defective circulation in any of the packing sections, causes serious loss in the amount of ammonia recovered from the gases.

The accompanying illustration shows a vertical section of the tower suggested. The gas-inlet pipe B is fitted to the lower end; while a gas-outlet pipe C is at the upper end. The former is bent downwards at its inner end, which is carried to the centre of the tower, so as to secure an even distribution of the gas. A water outlet or drain pipe D is attached to the bottom of the tower; while a small water-inlet pipe E is connected to the lower end. The packing is arranged in three separate tiers—composed, by preference, of the usual brick chequer work. [A few courses only of the chequer work at the top and bottom of each section are shown.] Each section is supported on metal bearers or beams H, carried on angle irons fixed to the sides. A mixing space J for gas and water or other liquid employed is left between the top of each section and the bearers of the next section. A manhole K is formed in the casing opposite each space J, so as to provide means of access for inspection of the parts or for the removal of a packing section without interference with the others. A main inlet pipe L, for water or other liquor, is fitted to the cover of the tower, and a plate formed with perforations for spraying the water is arranged across the tower a little below the inlet.

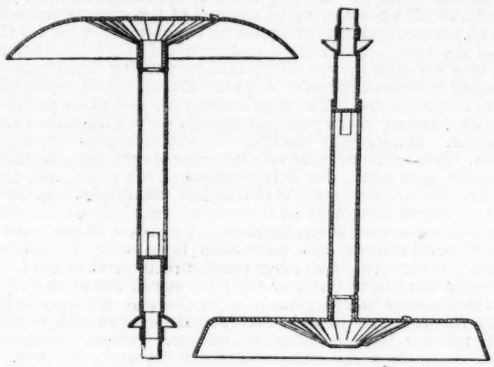
The gas on entering the tower first strikes the flat base and is spread out in a stream, which rises evenly upward through the whole area of the packing. The gas then issuing in streams through the top of each of the packing sections becomes thoroughly intermixed within each mixing space J before entering another section of packing; while the water falling through the main inlet pipe L flows over the packing in streams and splashes and intermixes again in falling from one section of packing to the other, thereby ensuring a thorough washing or cooling of the gas. The turned-down end of the gas-inlet pipe B serves as a means of shutting the gas off the tower, by running in water through the small supply pipe E, until the end of the pipe B is sealed.

Gas-Burners for Heating Purposes.—Schmidt, C. C. F., of New York, and Gunz, O. F., of New Jersey, U.S.A. No. 24,358; Nov. 10, 1903.

The burner is constructed (as shown) with a flanged or cup-shaped disc or plate. An inverted cone-shaped or cup-shaped radially slotted plate is secured to the underside of the disc in such a manner as to form an inverted cone-shaped or cup-shaped chamber on the underside of the disc. The mixture of gas and air admitted into this inverted chamber is ignited at the slits in same. The edges of the slits slightly overlap, and thereby the flame is caused to rotate more or less within the confines of the flanged disc. A mixture of gas and air is conducted to the space beneath the flanged disc by a gas and air supply tube having air inlets as usual in a bunsen burner.

In the first construction shown, the gas and air supply tube extends upward and leads the gas into the lower smaller end of the cone-shaped chamber formed by the slotted plate; and the disc is thus supported by means of the plate from the gas-supply tube. In the second form of

construction, the disc is provided with a central opening with a neck on which the gas and air supply tube is applied; the tube in this case being either suspended from a downwardly projecting pillar or from a



curved tube connected with the pillar of an ordinary burner. The gas here enters through the neck into the upper larger end of the inverted cone-shaped chamber formed by the slotted inverted cone-shaped plate.

APPLICATIONS FOR LETTERS PATENT.

27,946.—Payton, J. I, "Coating pipes." Dec. 21.
27,952.—Jarman, T. A., and Dodson, L., "Anti-vibrator." Dec. 21.
27,960.—Grieve, G. K., and Peebles, W. C., "Gas-governors." Dec. 21.
27,992.—Reichwald, A., "Gas-engines." A communication from F. Krupp. Dec. 21.
28,031.—Mond, L., "Gas-producers." Dec. 21.
28,095.—Barker, G., "Incandescent gas-lamps." A communication from the Block Light Company. Dec. 22.
28,100.—Parsons, H. M., "Mantle saving rod." Dec. 22.
28,140.—Chorlton, A. E. L., "Reversible internal combustion engines." Dec. 22.
28,188.—Haddan, H. J., "Acetylene-generators." A communication from E. Frenot. Dec. 22.
28,287.—West, J., "Charging and discharging retorts." Dec. 23.
28,326.—Turner, F., "Gas-engines." Dec. 24.
28,336.—Kinnes, J., and Smith, J., "Gas pressure-regulators." Dec. 24.
28,342.—Bell, J. F., and Masters, R., "Gas-producers." Dec. 24.
28,375.—Nutting, J., "Boilers for gas-stoves." Dec. 24.
28,387.—Guy, F. C., "Gas and other pipes." Dec. 24.
28,402.—Kramer, E., "Incandescent burners." Dec. 24.
28,498.—Bowing, J., "Manufacture of gas." Dec. 28.
28,621.—Rowbotham, W., "Internal combustion engines." Dec. 30.
28,633.—Brown, J., "Regenerative flues." Dec. 30.
28,636.—Lee, J. U., "Manufacture of acetylene." Dec. 30.
28,644.—Clegg, J. T., and Wilmore, C. J., "Incandescent burners." Dec. 30.
28,668.—Meunier, S., and Anderson, J., "Controlling gas-jets." Dec. 30.
28,677.—Thomson, J., "Water-meters." Dec. 30.
28,715.—Broughton, R. T., "Oil-gas generators." Dec. 31.
28,741.—Hilliard, L. B., "Gas-jet heating device." A communication from V. Kost. Dec. 31.
28,761.—Boult, A. J., "Water gas." A communication from W. A. Köneman. Dec. 31.
28,770.—Geary, A. J., "Kettle for gas-stoves." Dec. 31.
28,812.—Thompson, W. P., "Gas-engines." "A communication from O. C. Duryea and M. C. White. Dec. 31.
28,815.—Clerk, D., Bickerton, H. N., and Bradley, H. W., "Internal combustion engines." Dec. 31.

The Proposed Water Board for Oakengates and the District.—A crowded meeting of ratepayers was held in the Oakengates Town Hall last Wednesday evening, for the purpose of considering the question of promoting a Bill to constitute a Water Board for the urban district of Oakengates and Dawley, and parts of the rural district of Wellington and Newport. It is estimated that the scheme would cost about £50,000, and the initial cost to the Oakengates district would be £24,469. Mr. E. Holmes, who presided, proposed that the meeting should approve of the promotion of the Bill. Testimony was borne by several speakers to the urgent need of a better water supply in the district; and the proposition was carried.

Local Government Board Water Inquiries.—A Local Government Board inquiry was held at Oswestry last week into an application by the Corporation for a Provisional Order to enable them to acquire a farm which embraces the watershed of their reservoir. The Town Clerk explained that, on the death of the late owner, the farm was put up for sale by auction. The Corporation obtained the informal sanction of the Local Government Board to purchase; and they secured it for £3600—or about £15 an acre. They contemplated constructing on the land an additional reservoir, which would raise their storage capacity from 75 to 150 days' supply. The most important object, however, was to secure the purity of the watershed. The Corporation had power to take water from the Vyrnwy aqueduct of the Liverpool Corporation; but the charge of 9d. per 1000 gallons was prohibitive. An inquiry has also taken place at Settle into an application by the Rural District Council for sanction to borrow sums of £2700 and £600 for works of water supply for Settle and Giggleswick respectively.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Brick-Making by Gas Companies.

Sir,—I have read with great interest your article, entitled "A New Source of Economy for Gas-Works;" but it is not by any means a new (though an admirable) source of economy.

The reading of the article carried me back to my boyhood's recollection of the same work being done by my father, and carried on by him for more than thirty years, until the space occupied by the brick-kiln was required for extensions.

During the time I was Assistant-Engineer, under my father, I took very great interest in the making of fire-clay goods, and kept an account of the cost. It showed that the great saving was not so much upon the making of ordinary bricks as upon specials. Hence, as the gas-works grew and economy of space had to be considered, nothing but specials and arch-bricks were made. The cost—including the purchase of Stourbridge clay, labour, and fuel for burning—was, on the average, less than half that of purchased goods.

Our custom was to get in a stock of clay in the autumn; allow it to weather throughout the winter; and start brick-making in the spring—using the floors of the retort-houses as drying floors for the moulded goods. This we found gave better results than drying them by heated floors.

The kiln used was circular—built of stone, lined with fire-brick, and well bound together with iron bands. As far as I can remember, it never required rebuilding; but occasionally it had to be partially relined.

The old fire-brick material, with the proper proportion of new clay, was ground under edge runners, by the same engine that drove the pumps; and, with no further plant, every kind of fire goods, excepting retorts and 9-inch bricks, were made by a few of our men, who were stokers in the winter.

You will see by these notes that the Crystal Palace Gas Company are not the first (or the only) Company wherein this economy has been successfully practised.

Bristol, Jan. 7, 1904. William Fiddes.

MISCELLANEOUS NEWS.

SULPHATE OF AMMONIA MARKET.

Messrs. Bradbury and Hirsch's Review for the Past Year.

We have received from Messrs. Bradbury and Hirsch, of Liverpool, a copy of their "Review of the Market for Sulphate of Ammonia during 1903;" and, as on previous occasions, we extract therefrom those portions which most closely concern our readers.

Messrs. Bradbury and Hirsch open their report with a few observations upon the commercial, industrial, and agricultural situation; and then refer to the abnormal rainfall of the past year in its bearing upon the position of the farmer. They admit that there have been times when farmers have been in worse state—when they have been less able to meet their obligations—than they are to-day; but they do not think that in any recent year farming was more trying and less profitable than it was in 1903. A late spring, a cold and wet summer, and an almost continuously wet autumn, combined to disappoint and vex the tiller of the soil; for, though root crops were good, the hay crop, while fairly heavy, was indifferently housed. In the Northern Counties and in Scotland a large proportion of the corn crop was either harvested in bad condition or never housed at all. Hence they conclude that farmers must be in a worse financial position than they were a year ago, and but indifferently provided to face the winter months. Detaching the year from its prospects at the close, they think it will have been found that, on the whole, it was profitable to manure manufacturers. The coming season is being approached under much the same circumstances as last year, so far as the purchase and cost of materials is concerned; but, owing to the unfavourable agricultural outlook, manufacturers are far from sanguine about the outcome.

With regard to nitrate of soda, the year 1903 was much less eventful than the two preceding years, and consequently it provides less material for the reviewers to deal with. Yet they say there are points about the 1903 nitrate of soda trade which are not only interesting historically, but may serve for guidance in any attempt to forecast the course of the market over the next few months. The year opened tamely, but, the weather continuing favourable, deliveries from Continental ports in February were exceptionally heavy—no less than 193,000 tons. In March, too, they showed a substantial increase; but in April, owing to unfavourable weather, there was a set-back. In the latter month, however, prices were advanced; stocks at the time being much reduced by the heavy drain in February and March. The falling off in deliveries in April was adjusted in May and June—this being facilitated by the lateness of the season; for though actual deliveries from the Continental ports in these months were smaller than in May and June, 1902, owing to diminished stocks and famine prices, stocks in the interior were so far drawn upon that they were practically exhausted. Prices remained almost on a dead level up to the middle of March, when Continental consumption—the uncertain quantity at the outset—was assured. Even then there was no attempt to force the pace; the hardening of prices being gradual, and occasioned fairly by the exigencies of supply and demand. In May and June, however, extreme prices were paid on the Continent, pending further arrivals at the ports; stocks being well-nigh exhausted. When the question of fixing the quantity to be shipped over the twelve months April, 1903, to

March, 1904, came up for consideration, the Committee found themselves beset with difficulties, and accordingly they had to proceed cautiously and resist the pressure brought to bear upon them. Having regard to the practical exhaustion of the inland stocks on the Continent in June, and to the rapidly increasing requirements of the United States, they appeared, from the standpoint of July even, to err on the side of prudence if they erred at all; yet up to November the distributing class on the Continent remained altogether indifferent about buying ahead. It was only at the end of that month, when the visible supply for the European market was still some 25,000 tons less than that at the end of November, 1902, that the active interest of distributors on the Continent began to manifest itself. The visible supply of nitrate (stock and afloat) for the United Kingdom and the Continent at the end of last year was 640,000 tons—the same as in 1902—compared with 630,000 tons at the close of 1901. With respect to the consumption of this manure, Messrs. Bradbury and Hirsch consider there is room for a substantial shrinkage without endangering the market, because present stocks in the interior on the Continent may be anything up to 50,000 tons less than they were a year ago, and the actual supply at the ports will almost certainly be 25,000 tons less than it was from January to April last. So that in their judgment the present level of prices is well assured, and some advance probable.

Coming to the principal subject-matter of the "Review"—sulphate of ammonia—Messrs. Bradbury and Hirsch say it has sometimes been their unfortunate lot to have to condole with producers when offering their remarks on an unfavourable year's working, and try to find reasons for the market having miscarried; but they assure their readers now that the low-water mark in the trade has receded well into the past, and they have no desire to recall unpleasant experiences, unless, by contrast, to emphasize the highly satisfactory present. Though there was no reason to complain of the average prices for the previous four years, and though a still higher average was expected in 1903, they think the result has exceeded expectations—the actual average price having been £12 9s. 2d. per ton f.o.b. Hull. They admit that they under-estimated the possibilities of the situation twelve months ago, though they held a favourable opinion of the market. They give four tables of exports, covering the periods from January to March, April, June, and December, for the years from 1899 to 1903; the table for the first-named period having been inserted because the figures contained therein are specially significant of what had been going on up to that time. It shows that the shipments to Germany and Belgium (the latter mostly finding their way into Germany) up to the end of March were 1150 tons in excess of those for January to March, 1902; while the January to April table shows that within the latter month the shrinkage in shipments to Germany and Belgium amounted to 4000 tons. The total shipments to the Continent up to the end of April were 7300 tons less than those for the corresponding period in 1902. By the end of April, the situation had altered very seriously for the worse—6300 tons, to be exact. This could not fail to have an important bearing upon the market, though producers, not being burdened with stocks, strove desperately to postpone the inevitable reaction. There was stock to carry forward into May. The third table shows that at the end of June the Continent was upwards of 8000 tons behind 1902; but the shrinkage was trifling in May and June compared with that in April. The figures were not much changed in the following three months; the aggregate shipments up to the end of September remaining, as at the end of June, about 2000 tons below those for the corresponding period of 1902. The fourth table represents the present situation, and is eloquent as to the trend of the sulphate business. It shows that, next to Spain, the Colonies have become our best customers; and without the development in Colonial demand which occurred within the past year, it is regarded as certain that prices at the close would have been much below their present level.

Dealing further with this part of the subject, Messrs. Bradbury and Hirsch point out that until near the end of 1902, it was not generally realized that the output of sulphate of ammonia was not materially augmenting. Neither was the increasingly strong position of nitrate of soda attracting attention outside the trade. Consequently, the price of sulphate had drooped below its proper value in relation to the prices of nitrate and other nitrogenous fertilizers; and to such an extent was the market depressed, that large speculative sales were made for delivery four months, and even six months, ahead, at, in some cases, the level of spot prices for the time being. Makers were not misled so far as that, though they did make some cheap sales. But they quickly recovered their balance, and left the field to "bear" speculators, who only in December found out their mistake. Other speculators took a correct view of the situation in time to profit by it, and bought for an advance; and the two interests—the one in the operation of "covering," the other in forcing the pace—combined to bring about the phenomenal advance from £11 7s. 6d. per ton in November, 1902, to £13 7s. 6d. per ton in March, 1903. The reversion of the Continent to nitrate of soda, owing to relative cheapness, caused a relapse in the sulphate market in April; and the decline was not arrested until June, notwithstanding quite exceptional Colonial demand. In May and June, however, the Continent had to revert to sulphate, as nitrate prices had become inflated. This accounted for the firm sulphate market through June. July saw a further drop in values; but from August forward there was no great fluctuation until November, when £12 per ton was reached. This price represented a decline of £1 7s. 6d. per ton from the highest point reached in March. The only diversion in the second half of the year up to December was created by the shale miners' dispute in Scotland in September and October; it being anticipated that it might occasion a serious shrinkage in the shale output of sulphate during the winter months. In October, extensive purchases were hastily made, for near as well as for distant months, and in November there was a good deal of reselling—in some cases at much below £12 per ton. The situation at the end of November was very similar to that at the same period in 1902, except that forward speculative sales had been made at prices about 10s. per ton higher, and on a more moderate scale. December, like December, 1902, saw a smart recovery in prices; but the special demand came from the Colonies, the Pacific, and Japan, and not from Germany. Throughout the month there was keen competition for spot parcels, which had rather accumulated in November; and by the close the price had advanced to £12 7s. 6d. per ton, with a very firm market, and every indication of a further advance. Large purchases were also made for forward delivery, in all positions, up to the end of the current year—first at £12 10s. per ton, and later at figures up to £12 15s. per ton for the first half of the year. At the close, makers asked still higher prices, and were very indifferent about selling further, pending developments.

Passing from the disposal of sulphate, Messrs. Bradbury and Hirsch turn to its production. The most interesting, though as yet the least important, feature of the past year was the output from works making power gas. The quantity was about 6500 tons, or 2000 tons more than in 1902. It is remarked that this indicates slower progress than was expected a year ago. But it is progress all the same, and, as other large installations are in course of erection, the authors look for a still further forward movement in the current year. There has been no material increase from shale, for though, by means of improved plant, some of the oil companies have increased their make of sulphate, they have only made up the deficiency occasioned by works closed. From iron-works the output last year remained about the same as in 1902, and the increase from carbonizing works was not very material; though this year new plant in the Tyneside district will, it is anticipated, account for a substantial increase. Messrs. Bradbury and Hirsch under-estimated the output from gas-works in 1902. They have endeavoured to make that for 1903 as accurate as possible; and they find the evidence from different localities, representing practically every industry, widely varying. In most important industrial centres there has been no rise at all, owing to the extended use of electric light, water gas, and incandescent burners; while in other cases the increase is put at from 2 up to 5 per cent. They estimate the production of ammonia, calculated into sulphate of ammonia (including that used in the manufacture of ammonia soda and other chemical processes), from all sources in the United Kingdom during 1903, at 234,000 tons, apportioned as follows:—

	Tons.
Gas-works	152,000
Iron ,,	18,000
Shale ,,	37,500
Coke and carbonizing works and producer gas.	26,500
	234,000

Of this production, they reckon that England contributed 154,500 tons; Scotland, 77,000 tons; and Ireland, 2500 tons. The output (in tons) during the previous five years was as follows:—

	1902.	1901.	1900.	1899.	1898.
Gas-works	150,000	143,000	142,000	134,000	130,000
Iron ,,	18,500	16,500	17,000	18,000	17,700
Shale ,,	37,000	40,000	37,000	38,500	37,300
Coke and carbonizing works and producer gas	23,500	18,000	17,000	15,000	11,500
Totals	229,000	217,500	213,000	205,500	196,500

The authors' estimate of production in 1902 being below the mark, the stock brought forward in 1903 probably exceeded their anticipations; but the difference disappeared mainly in home consumption for chemical purposes. Assuming the stock was 12,000 tons, the account for the year 1903 will stand as follows:—

	Tons.
Stock brought forward from 1902	12,000
Production in 1903	234,000
	246,000
Exports in 1903	162,300
Home consumption (for all purposes) in 1903	71,700
Stock to carry forward into 1904	12,000
	246,000

The present year, therefore, will open with a stock no larger than that on hand at the end of 1902; and Messrs. Bradbury and Hirsch consider that, from the point of view of stock and the probable production over the spring months, the position could hardly be stronger. They say that, so far as can be seen, no great increase in output need be expected from gas-works—by far the largest source, and representing nearly two-thirds of the whole. With regard to the remaining one-third, as already remarked, a substantial increase during 1904 from power gas works and from coke-ovens may be expected. But this will be too late to affect the supply in the near future. Shale will contribute more; but probably not 1000 tons more than in January to April last. So that there is nothing to be alarmed about for the present. Foreign production, however, is only less important than home output; and, as in previous years, the authors' have taken the best local opinion in each case with regard to it. The output on the Continent is estimated to have risen some 10,000 to 12,000 tons, and mainly in Germany; while the increase in the United States and Canada has probably been 5000 tons. There may be a similar increase in Canada and the United States in the current year; but the condition of trade on the Continent does not promise any important increase there. As to the United States, in view of the short cotton crop last year, it seems tolerably certain that the cotton area will be extended, and cultivation otherwise stimulated. Consequently, the opinion is entertained that every ton of manure, both nitrogenous and phosphatic, available will be required. Hence an increased demand for sulphate is looked for from America. The authors' anticipations with regard to Colonial demand were more than realized last year, and there is promise of much larger requirements in 1904. Demand for the Pacific has also revived, and bids fair to exceed its old proportions. Japan took some 3000 tons during the year; and it is thought that this quantity may easily be doubled in 1904, unless the present strained relations with Russia unhappily end in war. There have also been shipments to the Cape; and there are immense possibilities in that quarter, though they may be slow to develop. As to the home demand, except for chemical purposes, and perhaps in the preparation of compound manures for

export, it is not over-promising, though there is large inquiry for delivery over the spring months. With regard to prices, Messrs. Bradbury and Hirsch are of opinion that, all things considered, they will rise beyond their present level in the near future; while an increased demand for Colonial, Japanese, and Pacific requirements will keep the market clear of stock for some time to come.

The "Review" concludes with the usual record of the course of the market month by month; and this is followed by the customary tabulated statistics. The first table contains the comparative weekly prices of sulphate of ammonia and nitrate of soda last year. In the week ending Jan. 3, sulphate was 12s. 0¾d. and nitrate 9s. 3d. per cwt.; on April 4, the prices were 13s. 3d. and 9s. 6d.; at Midsummer, they were 12s. 7½d. and 9s. 6d.; at Michaelmas they were 12s. 3d. and 10s.; while at the close of the year they were 12s. 4½d. and 9s. 9d. respectively. The second table gives the average prices per ton of good grey (24 per cent.) sulphate f.o.b. Hull; the figures ranging over 37 years—1867 to 1903. The following are the averages for the past ten years: 1894, £13 3s. 8½d.; 1895, £9 15s. 4½d.; 1896, £7 18s. 0¼d.; 1897, £7 18s. 4¾d.; 1898, £9 9s. 7½d.; 1899, £11 5s. 9¾d.; 1900, £11 2s.; 1901, £10 11s. 4d.; 1902, £11 16s. 3d.; and 1903, £12 9s. 2d. The third table shows the average prices per hundredweight of 95 per cent. nitrate of soda, in Liverpool, for the past ten years. They are as follows: 1894, 9s. 4¼d.; 1895, 8s. 2¼d.; 1896, 7s. 11½d.; 1897, 7s. 9½d.; 1898, 7s. 6¾d.; 1899, 7s. 11¾d.; 1900, 8s. 5½d.; 1901, 8s. 11½d.; 1902, 9s. 4d.: and 1903, 9s. 6½d.

SOUTHPORT CORPORATION GAS UNDERTAKING.

Twenty-five Years' Progress under Mr. John Booth.

As intimated in our "Personal" column, Mr. John Booth, the Gas Engineer and Manager to the Southport Corporation, has resigned this position, which he has held for close upon 25 years, and will be released from his duties about May next; and, by an announcement which appears in our advertisement pages, the Gas Committee are inviting applications for the appointment. We have given elsewhere a short sketch of Mr. Booth's career; and the following particulars will furnish an indication of the extent of his work since he has been at Southport. He obtained the appointment in May, 1879, at a salary of £250 per annum, which has been gradually increased to £400. On entering upon his duties, he found the Gas Committee in trouble with reference to the sale of coal, owing to their ordering more than they could use, and selling the surplus in the town in competition with the local merchants. At that time the annual make of gas was 171,550,000 cubic feet; now it is 428,280,000 cubic feet. The quantity then sold was 145,477,000 cubic feet, compared with 411,646,000 cubic feet now. The number of consumers has gone up from 5538 to 12,276; while the unaccounted for gas has been brought down from 13·62 to 3·38 per cent., the capital employed per ton of coal carbonized from £8 4s. 7d. to £6 5s. 4d., and per 1000 cubic feet of gas sold from 19s. 4d. to 12s. 10d. The price of gas then was 4s. per 1000 cubic feet. But in three years it was reduced to 3s.; and though it has fluctuated, this has been the average. Now, however, gas is sold at 2s. 8d. per 1000 cubic feet. Meter and service-pipe rentals have been abolished. The capital debt of the undertaking now stands at £265,385; and the sinking fund applied in repayment of loans is £64,018. The capital expenditure has been more than the Gas Estate warrants; but this is accounted for by the fact that an outlay of about £65,000 was incurred on the original works in Eastbank Street. The expenditure on the Crowlands works, incurred under the Act of 1876, amounted to £193,000. In 1879, the mileage of mains was 43; now it is 74. The plant is now capable of producing 3,270,000 cubic feet of gas per day; but the maximum day's make so far has been 2,372,000 feet—showing a margin of about a million cubic feet for future demands.

Extensive plant for dealing with the residuals has been erected, especially for the manufacture of sulphate of ammonia. When Mr. Booth went to Southport, there were large stocks of spent lime from the purifiers; but since then mortar-mills have been constructed for utilizing this product, which is now supplied in considerable quantities to meet an ever-increasing demand. Early in the eighties, Mr. Booth reported on the advisability of adopting oil gas; and plant was installed in 1894, with apparently satisfactory results—the saving accruing from this means of enrichment amounting in the first year to between £2000 and £3000. In the years between 1879 and 1903, the following sums were paid from the gas-works revenue account: Interest on loans, £134,140; repayment of loans through the sinking fund, £51,594. In addition, the net profits realized amounted to £185,895. In 1894, owing to increased gas consumption, it was necessary to consider the question of providing additional storage. The subject of the introduction of carburetted water-gas manufacture subsequently came up, and Mr. Booth reported in favour of the erection of plant at Southport similar to that put up at Belfast. A contract was entered into for plant equal to a make of 750,000 cubic feet per day; and its inauguration by the then Mayor (Mr. G. Eastwood) took place on Sept. 1, 1896. Another section of this class of plant has just been put up, and the capacity of the two sections enlarged; bringing up the total capacity to 1,650,000 cubic feet per day. It was calculated at the time the first portion was installed that the saving in cost, as compared with the erection of a new gasholder, was about £14,000; and the general view of the Committee is that the new plant, while useful as a stand-by, fulfils the purpose mentioned. Oil-gas plant on the Peebles system has also been put in. Another feature of the latter part of Mr. Booth's *régime* has been the introduction of West's compressed air stoking machinery and coke-handling plant. The whole of the work has been carried out under Mr. Booth's personal supervision; and it is claimed that it has been successful both from a humane and a financial point of view. The latest addition has been the introduction of a hydro-extractor in connection with the sulphate apparatus. With regard to the retorts, Mr. Booth has been somewhat conservative, and these being still of brick, reform in this direction would be one of the first duties of the new Manager. At present all the retorts are in use with the exception of six beds; and if a big demand were to arise, there is not much room left for a margin. During the period of Mr. Booth's management, there has been an uninterrupted expansion and alteration of plant, caused by the continually increasing demand for gas, notwithstanding the large use of incandescent and other more economical burners, both by the town for street lighting and by private individuals. Finally, a matter for gratification is that the old feud between Southport and Birkdale with regard to the gas seems to have vanished. Part of the trouble arose through the tests being made with different instruments at the two places; but the argand burner is now used in both.

STEPNEY COUNCIL AND THE COMMERCIAL GAS COMPANY.

A Repairing Dispute—Test Case to be Heard.

A dispute has arisen between the Stepney Borough Council and the Commercial Gas Company as to the manner in which the Company are bound by law to relay pavements which have been taken up in connection with their undertaking; and the Town Clerk has been instructed to take legal proceedings in order to obtain a judicial decision on the point. The dispute has especial reference to the use of concrete in cases where the employment of this material is necessary. On behalf of the Borough Council, it is contended that concrete must be used in such reinstatements; while the Company hold that they can only, as by law enacted, reinstate the pavement "of the kind and quality found." The Company add that the Council seek to enlarge their responsibility in the matter of concreting; and this they cannot accept. This important issue between the Council and the Company has been the subject of correspondence since the Council came into existence three years ago. It was hoped by the Council that an agreement could have been entered into with the Company placing the matter on a satisfactory basis, as contemplated by section 115 of the Metropolis Management Act, 1855, as was done in the case of the East London Water Company.

In the course of the correspondence, the Engineer of the Company points out that in November, 1880, the Mile End Vestry (now merged in the Stepney Borough Council) brought an action against the Gaslight and Coke Company, alleging that the road then in question was not repaired to the satisfaction of their Surveyor. The Company had reinstated the road as they found it; but the Vestry asked them to put in concrete, which was not there before. The case was heard at the Thames Police Court; and, after being fully argued, the Magistrate dismissed the summons. The Works Committee of the Stepney Borough Council, however, state that the question in dispute then was not as to the particular "materials" used, but had relation to the "method" of reinstatement adopted. They say proceedings were taken under the provisions of the Metropolis Management Act, and that it was quite possible that the result might have been different if they had been launched under the Gas Works Clauses Act of 1847, which statute is applied to the Metropolitan Gas Companies by section 2 of the Metropolis Gas Act of 1860.

In the proceedings about to be taken against the Commercial Gas Company by the Council, the latter will seek to recover a sum of 9s. in respect of cement concrete provided in connection with the reinstatement of asphalt paving, which the Council had carried out on behalf of the Company. This amount the Company refused to pay, as they were only bound to reinstate the pavement as it was found. The Works Committee point out that they have no objection to excavations made by the Company being "reinstated with the same or similar materials of like quality and thickness," provided that the other requirements of section 111 of the Metropolis Management Act, 1855, are complied with—namely, "that such materials are cemented and bound together in the same manner, or in an equally substantial manner, as those of which it was composed." The Committee add that "it is obvious that asphalt paving cannot be laid, or properly reinstated, without the use of concrete," and that the Act of 1855 provides that the cementing and binding together of the materials have to be done "in such manner as is satisfactory" to the Council. In order, therefore, to obtain a legal decision on this point, and so settle a constantly-recurring source of dispute, the Town Clerk of Stepney will summon the Company.

PREPAYMENT METERS FOR BELFAST.

The minutes of the Gas and Electricity Committee which were submitted to the adjourned monthly meeting of the Council of the County Borough of Belfast on Monday of last week, referred to the proposed introduction of prepayment meters into the city, which was noticed in the "JOURNAL" for Dec. 8 (p. 627).

Mr. Doran, in moving the adoption of the minutes, said that very full information had been obtained from four large English cities, where the system had been working for years; and the result of their experience had been embodied in a report by the Chief Inspector (Mr. Cleland) and the Collector (Mr. Andrews). They had also prepared from this collected information a carefully thought-out report dealing with an installation adapted to the requirements of Belfast. The Committee had gone into the details of this, and hoped to be in a position to introduce the meters in the course of another week. He would just say a word on the estimated growth of the system. They had assumed an ultimate proportion between prepayment and ordinary consumers of one to five; and, taking their ordinary consumers' increase at the rate of 2000 per annum, they should have during 1904 200 prepayment consumers; in 1905, 600; and in 1909, 11,000. These figures might appear rather sanguine; but the Committee were convinced that there was a reasonable prospect of remunerative business. Once the class of householder that the scheme was intended to benefit realized the convenience and cleanliness of lighting their apartments

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and of cooking by gas, the prepayment meter would be largely availed of. It should specially appeal to those who had to be early out, and who would appreciate a quickly-prepared cup of tea or coffee. The Committee proposed to give 30 cubic feet of gas for a penny. This should induce all who at present burned oil to become consumers. Weekly or monthly rented houses, from 7s. 6d. per week downwards, would be divided into three classes; and, in addition to the prepayment meter, fittings would be provided according to the class of house to be supplied. Mr. Dempsey said that he had discovered that some 200 gas-stoves were ready to be broken into scrap. He thought there were many things in connection with the undertaking which required investigation. They could, he was sure, save £25,000 per annum if proper attention was paid to the manufacture of gas. The price should be reduced 3d. per 1000 cubic feet from April 1 next. The present generation was really being taxed for subsequent ones. Alderman Sir James Henderson remarked that little things might occur, and he dared say did occur; but in his opinion, as an old member, the Gas Department was being conducted in a very satisfactory manner at the present time. The minutes of the Committee were, after some further discussion, adopted.

GAS-METER TESTING IN MANCHESTER.

The following annual report has been issued to the Manchester City Justices by the Gas-Meter Testing Committee: It will be remembered that last year's report contained an agreement between your Committee and the Manchester Corporation Gas Committee in reference to the "double test" for all Corporation gas-meters. Your Committee in that report also considered the adoption of the "double test" justified by the result of the five months' working from July 1, 1902, and quoted two meters found registering 100 per cent. of error. After further experience of the last twelve months—during which time the work of the department has considerably increased—several more meters have been found registering incorrectly (to the extent of 100 per cent.), owing to wrong indices being attached, which will be duly recorded in the Inspector's annual report on the 31st of March next. Your Committee can now confirm the opinion expressed in their last report as to the value of this precautionary test for the protection of both the producer and consumer of gas in the city. Correspondence has passed between the Committee and the Public Control Department of the London County Council, relative to the additional test and our method of working, with a view of making the test compulsory by Act of Parliament. The work of the department has been carried on satisfactorily throughout the year. During the year ended Nov. 30, the number of meters tested was 43,138, and the fees charged £1659; this being an increase over the figures for the previous year of 5874 meters tested, and £423 fees. Owing to the large increase of work in the department, two new test holders are to be purchased.

FATALITIES FROM GAS.

Late on Saturday, the 2nd inst., some consternation was caused at Shalesmoor, Sheffield, by the discovery that two people had been overpowered through inhaling gas which had accumulated in the cellar of the house in which they resided. The scene of the disaster was No. 64, Russell Street, where there lived a widow named Mrs. Havenhand, about 60 years of age, who had two male lodgers—one named Angus Marsden, a steel melter, aged 38, and the other named Perrett. The woman was of regular habits, and it was her custom to do her shopping early in the day or evening; while Marsden was a sober man, who was probably in his lodgings by ten o'clock. The discovery was made at a quarter past eleven by Perrett, who on opening the door was met by a strong odour of gas. Looking round the room, he saw Mrs. Havenhand lying unconscious on the sofa, and Marsden in a state of coma sitting in an arm-chair. The assistance of two constables was procured, and the unfortunate man and woman were taken into the fresh air. First aid was rendered, and the two sufferers were removed to the Royal Infirmary; but on reaching it the woman expired. Marsden, however, improved to a great extent under the treatment he received, and by Sunday night he had made considerable progress towards recovery. The matter was investigated by the Deputy City Coroner (Mr. Kenyon Parker), on Monday last week, when Mr. W. E. Clegg attended on behalf of the Sheffield Gas Company, whose Engineer (Mr. J. W. Morrison) and Superintendent of Mains (Mr. H. A. Cleghorn) were present. Evidence of identification having been given, Perrett was called. He stated that there was a strong smell of gas about the house in the morning and afternoon of the day of the fatality. Notice had been given to the Company, whose men had by half-past two o'clock commenced making an excavation on the footpath outside the house. When he arrived home at night, he discovered the two occupants of the place overcome, though he did not then smell gas. The deceased had told him during the day that the workmen had advised her to put the fire out. Evidence was given by employees of the Company, who found on Saturday morning that an escape of gas which had been reported was outside the house. A 6-inch pipe running under the cellar grate was broken, and the escape of gas was so strong that the workmen could not stand it. They could not stop it with white lead, so, as a temporary expedient, clay was packed round the pipe. Mrs. Havenhand was warned not to light a fire, and to leave the doors open. At half-past seven at night the house was free from gas, and the precautions against explosion were relaxed; the only advice left by the men when they ceased work being that the door should remain open for a time. Mr. Cleghorn, who examined the main early on Sunday morning, said he found there was no escape from the temporary repair. The earth around the fracture would no doubt become saturated with gas, and then the smell would disappear. This would account for its non-detection by Perrett. If the door had been kept open, the fumes would not have accumulated

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	ACCRINGTON	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,800,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000	TORONTO (Fourth Contract)	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
MONTREAL, ONT. (Second Contract), 1,800,000 C. Ft. HAMILTON, ONT., 400,000 C. Ft.

in the house; and if the advice given had been followed all would have been right. A Juryman asked witness why he did not replace the broken pipe when the escape was discovered. The latter replied that this would have been impossible, as it would have been necessary to keep the whole neighbourhood in darkness while the pipe was being replaced; and, as a matter of fact, no difference would have been made, because Mrs. Havenhand's death was caused by the accumulated gas that had escaped before the temporary repair was effected. The Coroner, in summing up, drew attention to the fact that the evidence showed that the repair to the pipe had been well done, and that the occupants of the house had not heeded the warnings given to them. A verdict of "Accidental death" was returned.

Last Friday, a serious case of suffocation by gas occurred at Stockton, in a locality known as Mason's Court, in which there are five houses. Fourteen persons were more or less affected, and one was found dead. It appears that all day on Thursday, and during the night, an escape of gas from a pipe outside the court on the Quayside was detected. The gas had passed through the ground under the flooring of the kitchen of the house of George Marley, where he resided with his wife and four children and his father, Thomas Marley, a labourer, aged 54 years. Early on Friday, when George Marley got up to prepare for work, he went to awake his father, who slept in a small apartment off the kitchen. He received no response from the man, and on close examination found him dead. Marley immediately ran back to the bedroom, where he had just before left his wife and children, and it was only with some difficulty that he was able to arouse them. Two of the children were almost suffocated. On the arrrival of assistance, the children were attended to, and an entrance was forced to the houses adjoining. In the first an old woman named Jane M'Millan and a girl named Mary Dolan were lying unconscious. The former gradually recovered; but the girl remained for some time in a dangerous condition. Next door, where resided Mr. and Mrs. David M'Millan and Mrs. M'Millan's father, the effects of the gas had not been so seriously felt. Later in the day an inquest was opened on the body of Thomas Marley; and after evidence of identification had been produced, it was adjourned till yesterday afternoon.

REMARKABLE EXPLOSIONS.

An explosion of gas arising from a somewhat unusual cause took place a few days ago in a yard connected with the Royal Hotel, Devonport. The hotel is lighted by electricity, which was formerly generated on the premises by means of a gas-engine. Recently the current has been taken from the Corporation main; and the gas-engine and the meter connected with it have not been used, though they remained on the premises. On Thursday, one of the workmen in the employ of the Corporation Electricity Department went to do some small repairs, and turned on a jet in the gas-engine house, with the object of heating some small tool. When he tried to light the jet, a loud explosion occurred in the yard outside, which wrecked the meter and broke a number of panes of glass. It is suggested that a vacuum had been caused in the pipe leading from the meter; and that when the lighted match was applied to the burner, the flame was drawn in through the pipe, and thus reached the gas in the meter.

Another explosion for which an electrical installation was in some degree responsible took place at Exeter yesterday week. There had been a leakage of gas for a day or two near Bedford Circus, and men were sent by the Gas Company to locate and stop it. They opened up the street, but did not find the leakage, and left the work to go to dinner. Shortly afterwards, a violent explosion occurred near the spot in a transformer chamber connected with the Corporation electricity supply. The heavy iron cover of the chamber was lifted over the railings in front of one of the houses; and the flag-stones and railings were torn up. The fittings of the chamber were damaged; and the electricity supply was interrupted. It was subsequently found that there was a leakage of gas from one of the street-mains; and there was no doubt an accumulation in the transformer chamber, where possibly an electric spark caused it to become ignited.

Last Wednesday night some alarm was caused by an explosion at the junction of Mosley and Grey Streets, Newcastle. It was discovered that, owing to an accumulation of gas, two of the National Telephone Company's manhole covers had been burst from their fastenings, and hurled several feet in the air. The covers, which weigh about 2 cwt. each, are 2 inches thick; and they were broken to fragments. Fortunately, though many people were about, no one was injured.

Last Saturday, a loud explosion occurred near Woodside Ferry, Birkenhead, and flagstones were hurled in all directions. Some children playing near were blown over; one of them receiving injuries to the head from the flying *débris*. A single tram-line adjoins the manhole where the accident took place; and it is thought that a spark ignited gas from the main, which is said to have been leaking.

THE MARYLEBONE ELECTRIC LIGHTING MUDDLE.

A Proposal from the Company.

At the Meeting of the Marylebone Borough Council on Thursday—the MAYOR (Rev. H. Russell Wakefield) in the chair—the electric lighting question was again under consideration.

The MAYOR reminded the Council that at their last meeting a Committee, consisting of himself, his predecessor in office, and the Chairman of the Electric Supply Committee (Mr. E. Debenham), was appointed to confer with the Metropolitan Electric Supply Company, and report to the Council the terms and conditions upon which the Company would agree to set aside the award in respect of the sale of the

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Marylebone portion of their undertaking. He was now in a position to report what the Committee had done. They had had two interviews with the Company, who had declined to set aside the award unless they received in some form a sum equivalent to the £1,212,000 which had been named by the Arbitrator as its value. The Company would, however, be willing to facilitate the completion of the purchase on terms. These they were asked to put in writing; and a letter received from them explained their suggestions. The Mayor read the letter, which contained the following suggestion:—

That, subject to the Borough Council leasing the Marylebone undertaking to the Company from Jan. 1, 1905, until Dec. 31, 1931, the Company, instead of requiring immediate payment of £1,212,000 in cash, to accept stock having a charge upon the revenues and rates of the borough in priority to any subsequent loan, and bearing interest at a rate to be agreed; the Council to undertake to obtain for the stock a quotation on the London Stock Exchange, and redeem it at par in 42 years; the annual rent to be paid by the Company to be a fixed sum practically equivalent to the yearly interest on the stock. As regards capital to be provided by the Council in respect of the period from Jan. 1, 1902, until the commencement of the lease, the Company to pay interest from the commencement of the lease at the same rate as that agreed for the stock. On the termination of the lease, the Council to purchase, on terms to be arranged, a portion of the Willesden works (which portion the Company would so arrange as to be suitable and sufficient for the supply of Marylebone in 1932), and compensate the Company, also on terms to be arranged, for the capital to be expended by them in the borough during the lease. This suggestion was made on the supposition that no competition will be allowed within the Marylebone area, and it would, therefore, be necessary to provide that, in the event of such competition being sanctioned, the Company should have power to terminate the lease; the Company, from the date of such termination, supplying the Council with all electrical energy which the Council cannot themselves generate, subject to existing arrangements regarding the fixing of price by an Arbitrator to be appointed by the Board of Trade. If the Council are prepared to adopt such a suggestion, it would, of course, be necessary that the borrowing powers proposed by the pending Bill should be reduced, and other necessary amendments provided for.

Continuing, the Mayor said that, in addition to what was contained in the letter, the Company had put before the Special Committee, in conversation, a suggestion that, if the profits of the undertaking became greater as the years went on than they were now, they would pay a percentage of these extra profits to the Council. This suggestion, however, he would point out, was not contained in the Company's letter; and he had therefore asked the Town Clerk to write to the Company to ascertain whether or not this was an intentional omission from their letter. The Company had sent to this inquiry a reply, in which the Secretary (Mr. E. Cunliffe Owen) said the point referred to appeared to the Directors to be rather a matter of detail which might be subsequently discussed if the Council thought the general lines of the suggestions were practicable. This, said the Mayor, concluded the report of the Committee. He did not think that at present it was advisable that he should go into the matter at any length, but he had a sugtion to make. He thought it was desirable that, before the public meeting of the electors was held, the Council should meet to consider the Bill they were promoting in Parliament. He was of opinion that they should have a special meeting next Thursday, when they would be able thoroughly to consider the Bill. They ought to be in full possession of the details of the proposed measure.

The course suggested was agreed to.

NOTES FROM SCOTLAND.

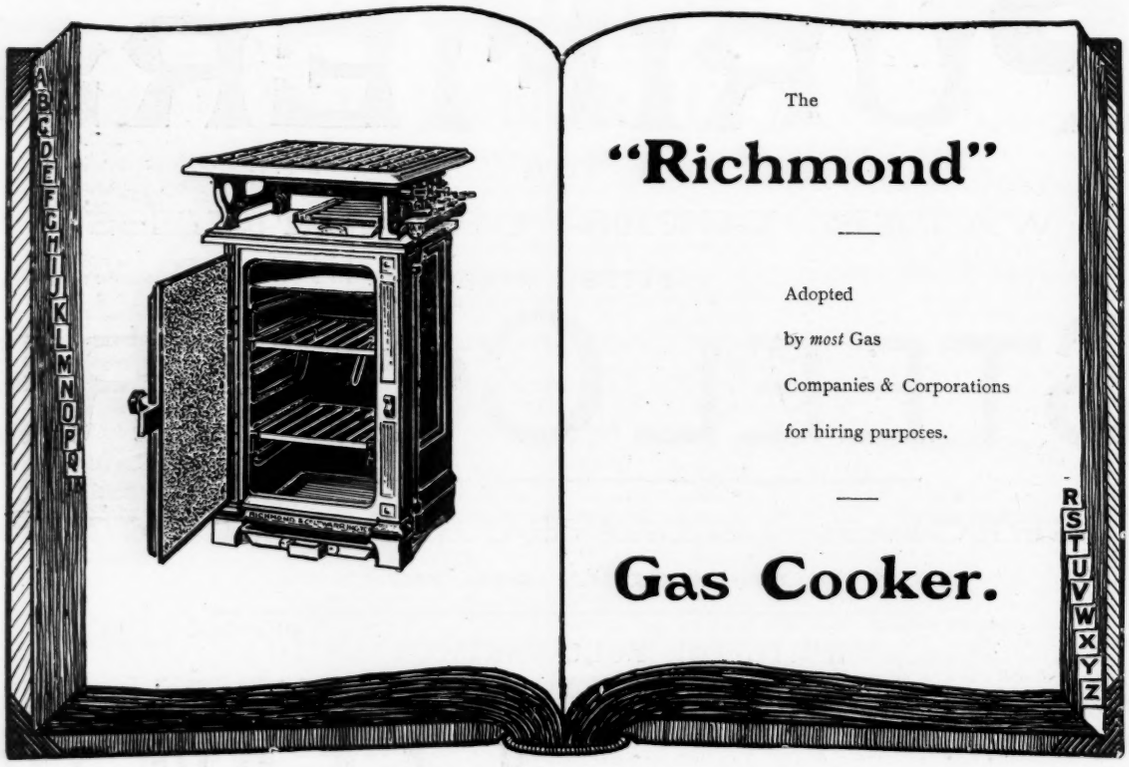
From Our Own Correspondent.

Saturday.

The recommendations of the Gas Committee of the Glasgow Town Council as to filling up the vacancies in the staff in the Gas Department, which were given in the "JOURNAL" last week (p. 18) were moved in the Council on Thursday by Mr. R. M. Mitchell, the Convener. The salaries, he said, had been fixed on a very moderate scale. Most of the men were young; and he believed they were quite satisfied with the emoluments offered. It was very satisfactory to the Gas Committee to know that they had in their service men fitted to occupy every position that became vacant. It reflected very great credit on the judgment of their late Manager, Mr. Foulis, in selecting his staff. Notwithstanding the considerable advance of the Electricity Department during the past year, there had been sent out 3 or 4 million cubic feet of gas in one day more than had ever been sent out before. It would be seen from this that all the newly-appointed officials had their work cut out for them. Under the management of Mr. Wilson, the new Manager, he thought the Council could look for a continuance of the success which had characterized the gas undertaking in the past. Bailie Finlay seconded the motion. Mr. Scott Gibson moved a series of reductions on the salaries fixed by the Committee. Mr. Coutts seconded. The recommendations of the Committee were, however, approved by a large majority.

The first plate of a new gasholder tank for the Corporation of North Berwick was laid by Bailie Sim at North Berwick on Wednesday, the 30th ult. After the ceremony, Mr. J. M'Gilchrist, of Dumbarton, the Engineer for the new works, proposed the toast of "Success to the North Berwick gas undertaking." The Contractors for the holder and tank are Messrs. Henry Balfour and Co., Limited, of Leven, Fife. It is expected that the new gas-works will be ready for use by next autumn.

The Aberdeen Town Council on Monday received a report from the Gas and Electric Lighting Committee upon the subject of the charge for gas consumed through prepayment meters. It stated that Mr. S. Milne, the Manager, had reported to them that the present price was as near as possible the correct one, having regard to the interests of the general consumers. The Committee submitted this report to the Council for the information of the members. Mr. Wishart wanted to know whether approval of the Committee's report by the Council would commit them to what was contained in the report. Mr. Kemp, the



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Convener of the Committee, thought it was for the Council to determine what they should do. The matter should not be discussed, as nothing could be done in it in the meantime. The Committee simply stated that they thought the information submitted was correct; and they placed it before the Council. Mr. Wishart said the question he wished to raise was whether the whole of the cost of substituting dry meters for wet meters was to be thrown upon the poor people who made prepayment for their gas. Provost Walker ruled that the matter could not be discussed that day, but pointed out that the report of the Committee did not commit them in any way.

The same Committee recommended that an inspection of the gas and electricity works be made by the Council, and that Mr. Kemp, the Convener, should be left to fix the date and make arrangements for it. Whereupon Mr. Kendall Burnett wished to be informed whether the proposed inspection was intended to be an entertainment. It is but a week or two since the community of Aberdeen were agitated by a controversy over what was regarded as extravagant expenditure in celebration of an extension of the tramways. This proposal of the Gas Committee gave opportunity for raking up the dying embers of the former dispute. This was done with considerable vigour and no little acrimony; but, in the end, the Council decided to have refreshments at the inspection, the same as before.

Over the signature of "A Conundrum," the following letter appeared in the "Glasgow Herald" of Wednesday last: "Why is it that in London, where coal is dear, a private Company—the South Metropolitan Gas Company—which pays a dividend to its shareholders, sells gas to its consumers at the same price as is charged in Glasgow, where coal is cheap, by the Corporation, which pays no dividend to anybody?" Somewhat the same idea seems to have occurred to the Editor of the "Dundee Courier," who, on the same day—a psychological coincidence, I suppose—devoted nearly half-a-column of his paper to working out a complaint regarding the charge which is made by the Corporation for electric current. By comparison with the prices in other towns, he makes out that the charge in Dundee for electricity to be used as a motive power is not fair. The figure is 2d. per unit; and in nearly every one of the places mentioned it is 1½d. per unit. Why, it is asked, should the price in Dundee be higher than in other places? It is absurd, the writer concludes, that such a high rate as 2d. should be charged for current for motive power. We all know that the difference in the illuminating power between the South Metropolitan and the Glasgow gas is sufficient to account for the prices being as they are. As to the charge for electricity in Dundee, well, the writer of the article would probably be surprised if he were told that it is largely owing to action by him and his kind that the Corporation are unable to give better terms. The credit of the city has been so much "cried down" in recent years, that it is no wonder that financial affairs in Dundee are somewhat stiffer than in other places.

It is entirely in accordance with the same spirit of distrust in everybody except yourself that, at a meeting of the Dundee Town Council on Thursday, Mr. Brownlee should have taken objection to a proposal by the Gas Committee to send Mr. Alex. Yuill, the Gas Engineer and Manager, Mr. Stevenson, the Convener of the Committee, Mr. Ballingall, and Treasurer Ritchie, to visit gas-works where carburetted water gas is manufactured, to obtain information on the subject. Mr. Brownlee did not think it was necessary to send such a deputation, as they could get all the information they required by letter. Mr. Stevenson pointed out that the Manager thought a personal examination was necessary in view of the large sum of money that might be spent. Mr. Brownlee said that he did not object to the Manager and the Convener going; but he objected to the others. The Council gave Mr. Brownlee his way; and only the Manager and Convener are to be sent to obtain the information they want.

A special meeting of the Stirling Town Council was held last night to consider the proposed Provisional Order which the Stirling Gaslight Company are promoting, the objects of which are to authorize the lowering of the illuminating power of the gas and the raising of additional capital. The Provost's Committee recommended that objections to the Order be lodged. Provost Thomson moved that this be done. They could not, just at that stage, he said, make public the details of Mr. Herring's reports to them; but he thought the Committee should be supported in their endeavour to secure more favourable terms for the town than the Gas Company were willing to concede. The Council approved the recommendation of the Committee, and the objections were brought forward and signed. One objection is to the taking of power to borrow so large a sum as £80,000, because it would have the effect of removing the Company from the official observation of the Board of Trade for too long a period. It is urged that £30,000 of additional capital ought to be ample. The alteration of the sliding-scale so as to make it not operative on the preference capital is objected to as being a retrograde step. There is also objection to the proposal to reduce the illuminating power of the gas from 25 to 20 candles, unless it be accompanied by a proportionate reduction in the price. The Provost's Committee were empowered to carry out the opposition of the Council to the Order.

Statistics as to the abnormal rainfall of 1903 are now coming in fast. The most striking I have seen are those relating to Greenock. There the average annual rainfall is 60 inches. Last year it amounted to 87 35 inches. At Stirling, the rainfall was 64·64 inches. The next highest year since observations began to be taken was 1877, when it amounted to 62·37 inches. The average rainfall in the district during the past 30 years has been 44·63 inches. The most important of all, however, is the series of figures which have been issued from the Glasgow Observatory. The total rainfall was 53·32 inches. There were 239 days in the year on which rain fell. The greatest recorded rainfall was in 1872, when the total was 56·18 inches, or 2·86 inches more than last year.

In accordance with an announcement which will be found in another column, the Newcastle and Gateshead Water Company are issuing by tender £100,000 of ordinary stock. The maximum dividend payable on this stock is 7 per cent. per annum; and the minimum price at which it will be allotted is £140 per cent. Tenders must be sent in by the morning of the 21st inst. to the Bank of England at Newcastle; or the preceding afternoon at Branches.

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 9.

Sulphate of Ammonia.

Throughout the week, demand has been well sustained; and there has been keen competition for everything offered for prompt and near delivery. The closing quotations are £12 15s. per ton f.o.b. Hull, £12 17s. 6d. per ton f.o.b. Liverpool and Leith. Requirements are still mainly for the Colonies and for covering January contracts—the Continent being practically off the market. In the forward position, there has also been large inquiry; but the firmness of makers hinders business. The nearest value of spring months is probably £13 per ton f.o.b. at the ports.

Nitrate of Soda.

This is very firm in all positions; and spot prices are 9s. 9d. per cwt. for ordinary, and 10s. per cwt. for refined quality.

LONDON, *Jan.* 8.

Tar Products.

There is really very little business in tar products just at present; and, if anything, prices have a downward tendency. The position of pitch remains unchanged; but although prices are weak, there appears to be rather more business in Belgium for delivery over the first six months of the present year—fuel makers doubtless believing it wise to cover their requirements now that the market has fallen so considerably. In London, all the large makers are very firm in their ideas, and will not accept the equivalent of prices ruling on the Continent. The demand from South Wales is not so good as it was in December; but in the event of war, it is quite possible that the demand for patent fuel from that quarter may be considerably increased. In benzol, the demand for 90 per cent. keeps good for gas enriching; but prices are a little easier, as aniline makers do not appear to be anxious to purchase for either prompt or forward delivery. Several parcels have been offered at 11d., but declined; and it is reported that 10¾d. was accepted for January-March delivery. In 50-90 per cent., there is really nothing doing. Consumers seem to take no interest in the article. The position of toluol and solvent naphtha remains unchanged, and prices are purely nominal, although the demand for home consumption is certainly improving as regards the latter article. The demand for creosote is still very strong, both in London and the Provinces, although a large railway contract was recently let at a lower price than had been anticipated. The demand for export still continues very good; but the difficulty in obtaining barrels prevents London makers accepting orders for same. In carbolic, the crude continues steady at 1s. 6d. to 1s. 6½d.; while crystals are decidedly firmer. The German makers are reported to have raised their price for 39-40 per cent. to 5d., doubtless in view of an improved demand should war break out.

The average values during the week were: Tar, 21s. 6d. to 26s. 6d. Pitch, London, 38s. to 38s. 6d.; east coast, 34s. 6d. to. 36s. 6d.; west coast, 34s. to 34s. 6d. Benzol, 90 per cent., 10½d. to 11d.; 50-90 per cent., 7½d. to 8d. Toluol, 7½d. to 7¾d. Crude naphtha, 3½d.; solvent naphtha, 9d. to 10d.; heavy naphtha, 10½d. to 11½d. Creosote, London, 1⅝d.; North, 1⅜d. Heavy oils, 2⅜d. to 2½d. Carbolic acid, 60 per cent., 1s. 6d. to 1s. 6½d. Refined naphthalene, £5 to £7. Salts, 24s. 6d. to 26s. 6d. Anthracene, "A" quality, 1⅝d. to 2d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market closes very firm, both for forward and prompt delivery. Beckton still quote £12 17s. 6d., but are practically out of the market for early delivery. The South Metropolitan Company are reported to have placed some quantity at £13 for February shipment, but are not offering any further amount at the moment. In Hull, a fairly good business has been done at £12 15s. for January shipment. In Leith, sales are reported at £12 15s. January shipment; but makers now as a rule ask £12 16s. 3d., and in some cases £12 17s. 6d., February-March shipment. Business has been done in Liverpool at £12 15s. and £12 16s. 3d., January shipment.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Business generally in the coal trade of this district has opened with the New Year only moderately. Pits did not in many cases get back into full operation after the holidays until about Wednesday last week; and this stoppage of output has necessarily restricted supplies coming upon the market. There is no particular briskness even about the house-fire coal trade, and, apart from the temporary conditions brought about by the holiday stoppages of pits, there is nothing to give any hardening tendency to prices. These remain without quotable change on the basis of 13s. 6d. up to 14s. 6d. and 15s. per ton at the pit for the best qualities, 11s. to 12s. and 12s. 6d. for medium sorts, and 9s. 6d. to 10s. 6d. for common house coals at the pit. Just now there is no surplus of common round coal, owing to house-fire requirements taking a good deal of this class of fuel off the market. Consequently, although the demand for steam and forge purposes is but limited, it is mostly moving away what collieries have to offer. Prices are about steady at 8s. to 8s. 6d. per ton for good ordinary descriptions, up to 8s. 9d. for the best qualities of steam and forge coal. Some of the Lancashire collieries are short of the better qualities of slack; but medium and common descriptions are generally plentiful. Prices are about steady at late rates, best slacks averaging 6s. up to 6s. 6d. and 6s. 9d. per ton at the pit, medium sorts 5s. to 5s. 6d., and common 4s. to 4s. 6d. For shipment, there has been a fair inquiry, with rather

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BISHOPSGATE, LONDON, E.C.

better prices obtainable; steam coals delivered at the Mersey ports or the Manchester Ship Canal averaging about 9s. 6d. per ton.

Northern Coal Trade.

The demand for coal is fairly brisk; and there has been a very good output in the last few days. As steamers in the rivers and ports had been increased, the shipments have been fairly good, more especially of gas coals. In steam coal, there is generally a dull season. The prices have thus been a little easier, though the output has been well taken up. Best Northumbrian steam coals are 9s. 4½d. to 9s. 6d. per ton f.o.b., second-class steams are 8s. 3d., and steam smalls 3s. 10½d. to 4s. In the gas coal trade, the demand on long contracts is very heavy, and takes up much of the production; so that the margin left for occasional sale will be limited for some weeks. Best Durham gas coals are quoted at from 8s. 9d. to 9s. per ton f.o.b., and second-class coals from 3d. to 6d. per ton less, according to quality. There is irregularity in the price of gas coke; but about 14s. per ton f.o.b. is a medium quotation.

Scotch Coal Trade.

Trade is not improving; but it is difficult to gauge, as a number of the miners have not yet resumed work. For the same reason prices cannot be quoted. The shipments for the week amounted to 162,018 tons—a decrease of 55,219 tons upon the previous week, but an increase of 6594 tons upon the corresponding week of last year. For the year 1903, the adjusted total was 11,337,442 tons—an increase of 156,856 tons over 1902.

Gas for the St. Louis Exhibition.—We learn from the "American Gaslight Journal" that the contract for the supply of all the gas to be used in the grounds and buildings connected with the "World's Fair" at St. Louis, some particulars in regard to which were given in the "JOURNAL" last week (p. 25), has been placed with the Laclede Gas Company. As the Exhibition will be open for seven months—from the 1st of May to the 1st of December (not September, as previously inadvertently stated)—it should prove a source of considerable additional revenue to the Company.

Reduction in Price at Ilkeston.—At the meeting of the Ilkeston Town Council last Tuesday (Alderman C. Maltby, J.P., the Mayor, presiding), a report was brought up from the Gas Committee in which, among other matters, it was proposed to reduce the price of gas 2d. per 1000 cubic feet as from Jan. 1, making it from 2s. 3d. to 2s. 6d. per 1000 feet, according to consumption. It was also proposed to advance the salary of the Engineer and Manager (Mr. F. C. Humphreys) by £50 per annum. After discussion and opposition on the part of labour members and others, the report was adopted by a large majority.

Limited Supply of Natural Gas in Chicago.—The People's Gaslight and Coke Company of Chicago have issued the following notice: "Owing to the constantly increasing demand for natural gas and its limited supply, we desire to caution our patrons in the matter of economizing in its use in furnaces and other methods of heating. The amount consumed by furnaces and boilers for heating buildings is so subject to sudden changes of temperature, that we cannot emphasize too greatly the importance of economy in the use of natural gas for heat purposes. We would, therefore, recommend that those of our patrons who are depending upon this fuel for heat should take the precaution of providing themselves with additional means of heating during exceptionally cold weather, when, for a temporary period, the supply of natural gas may not be adequate to meet a sudden increasing demand."

The Welsbach Incandescent Gas-Light Company.—An extraordinary general meeting of the Company was held last Wednesday, for the purpose of passing a resolution that the Articles of Association be altered by the addition of the following one: "The Directors may by resolution cancel any shares which have not been taken, or agreed to be taken, by any person." Mr. Mattinson, K.C., who presided, explained that it was a purely formal matter; and he did not suppose that the Board would have troubled to convene the meeting but for the fact that it was necessary to send circulars to the shareholders with reference to the reorganization. The Directors therefore decided to avail themselves of the opportunity to carry through this small, but at the same time desirable, modification of the Articles of Association. All that they proposed to do was to take power to cancel a few unissued shares. There were some deferred shares which had not been allotted to anyone, and which never would be allotted; and in order to round off the reorganization scheme, it was proposed to cancel them. He moved the resolution, which was at once carried unanimously.

Bilston Gas Company.—The report which was submitted at the annual meeting of the Bilston Gas Company last week showed that, after paying the usual interim dividend, there was an available balance of £4097, from which it was proposed to pay dividends of 5s. 6d. and 4s. per share on the "A" and "B" shares respectively (making 11s. and 8s. for the year), and carry forward £1412. Mr. Harold Holcroft said that since the last meeting their late Chairman, Mr. Thomas Holcroft, had resigned, after occupying the position for nearly forty years. In the early days, when the Company's works were at Moxley, a number of difficulties had to be contended with. They had a small output, and a large and scattered area to supply; and, owing to the ground subsiding through mining operations, disastrous results followed with regard to the mains. At the conclusion of Mr. Thomas Holcroft's services, they found themselves in a very different position, as the works and dividends had both improved. Difficulties still existed, as the district was yet sparsely populated, and subsidences and the breaking of pipes had to be dealt with. Another difficulty to be contended with was the putting up of the assessments of companies. For the past year, their local rates exceeded 2½d. per 1000 cubic feet of gas. During the past twelve months the sales of gas had been maintained. A water-gas plant had been put down in order to deal with a difficulty which might arise with a three days' fog. The report was adopted.

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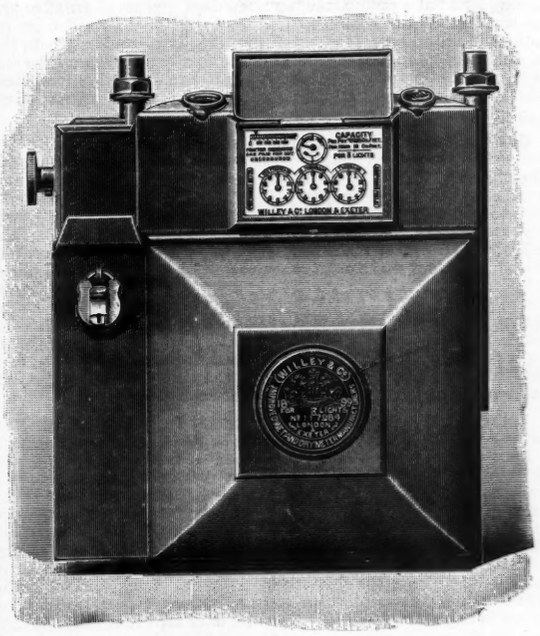

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Reduction in Price in the Crystal Palace District.—The Directors of the Crystal Palace District Gas Company have decided to lower the price of gas to 2s. 6d. per 1000 cubic feet (a reduction of 1d.) as from the date of the Christmas quarter's accounts.

Gas-Works Purchase Question at Portrush.—It was unanimously agreed at the last monthly meeting of the Portrush Urban District Council that the local gas undertaking should be acquired. Mr. Caldweli, moving the resolution, remarked that the purchase of the works would be a great benefit to the town.

Additional Capital for Stockport.—The Stockport Finance Committee are to be asked to apply to the Local Government Board for sanction to borrow £41,665 for the purposes of the Gas Department. Of this amount, £28,500 is required for new mains, meters, and stoves, based on an estimate for the next three years.

Incandescent Gas Lighting in Lambeth.—At the meeting of the Lambeth Borough Council on Thursday, the Lighting Committee reported, in connection with the alteration of the lighting in the Gaslight and Coke Company's district, that the conversion had been completed in three main roads and six side streets, while it was in progress in four main roads. Altogether, about 300 lanterns had been fixed up to the time of the Committee's meeting.

Charge of Embezzlement Against a Gas Manager.—At Chesterfield, last Friday, George Richardson, until recently Manager of the Bolsover Gas Company's works, was charged with embezzling certain sums of money received by him on behalf of the Company, and not accounted for. Mr. J. G. Parsons, the Secretary, gave formal evidence, and the accused, who was arrested in Dublin, was remanded. The money alleged to have been taken amounts to about £10.

The Cost of an Act of Parliament.—A report presented by the Torquay Water Committee to the Town Council last Tuesday stated that the total cost of obtaining the local Water Act of last year was £3157. Mr. Ball, a member of the Council, said the amount was enormous; and it was a downright scandal that they should have spent so much to obtain so comparatively simple an Act. The Mayor agreed that the costs were excessive, but contended that this was largely the fault of those who opposed the Corporation. But for the opposition, the costs would have been 50 per cent. less.

Skipton Water Scheme.—As has already been stated, the Skipton Urban District Council are promoting a Bill to enable them to carry out a water scheme estimated to cost £72,000. Some of the ratepayers are of opinion that this is a greater outlay than the town is justified in incurring; and at a public meeting a few days ago an alternative proposal was made, that a supply of water should be obtained from the Bradford Corporation. It is stated that Bradford is willing to do this at a charge of 9d. per 1000 gallons. Eventually the meeting decided that a petition should be presented to the Urban Council praying them to obtain from the Bradford Corporation all necessary information on the subject.

Gas-Works Extensions at Nottingham.—It is stated that the Nottingham Gas Committee have decided to carry out some improvements at their Basford Gas-Works, consisting, among other things, of a considerable addition to the railway sidings and the putting down of a cyanogen plant. The outlay on this work is estimated at about £3000; but the alterations referred to are, of course, only a portion of those which Mr. J. H. Brown, the Engineer, has reported to be necessary. The disabled gasholder at Eastcroft may eventually be replaced by one of the latest pattern, though the Committee are stated to temporarily favour the increase of the existing capacity of the holders. Mr. Brown has already been authorized to carry out several other important improvements which he has suggested, in addition to those he has already completed—notably a scheme for the equalization of the gas pressure, which in some parts of the city has been irregular, consequent on the great increase of the consumption in specific districts.

Estimates, Tenders, and Actual Costs.—In reply to a question as to why it was necessary for the Halifax Water Committee to apply to the Local Government Board for sanction to borrow £86,765 for the completion of the Walshaw Dean reservoirs and other water-works purposes, the Chairman (Mr. James Parker) admitted that the expenditure on these reservoirs had been very much in excess of the estimate; but he said the estimate was made as far back as 1876. He reminded the members that an estimate was one thing, a contractor's tender was another thing, and the cost of a completed scheme was still another thing, altogether different from either. Compared with other works that had been constructed, the cost of the Walshaw Dean scheme was not in any way excessive. As a matter of fact, they were not likely to get the reservoirs completed for anything like the amount mentioned in the first estimate, or the price set out in the tenders of the contractor. He even ventured to say that he believed the works would cost at least £220,000 or £230,000. It might be more. They were having a very good job made; and if the reservoirs were completed for less than £250,000, the ratepayers would have good cause to be thankful.

Competition Between Gas and Electricity at Halifax.—The Chairman of the Halifax Gas Committee (Mr. G. H. Wadsworth), referring in the Town Council to a proposal to further extend the electric cables, remarked that the consumption of gas was going down; and, seeing the extensions which the Electricity Committee were going in for, he could not help wondering if it was wise for two Committees of one Corporation, who were both dispensers of light and power, to carry on a sort of cut-throat competition with each other. Wherever a gas-engine was replaced by an electric motor, it meant so much reduction in the gas consumption, and consequent loss. If the Gas Department could not earn sufficient to pay standing charges, they would have to raise the price of gas; and so, in the end, the ratepayers would have to bear the burden of the competition. He suggested that there should be a conference of the two Committees on the subject. Alderman Hey could not see what object would be served by such a conference. He suggested that, if the Gas Department's revenue was declining, perhaps it might be due to the quality and in the increased price of the gas. There may be many causes besides the competition with electricity. Mr. Wadsworth's proposal was not adopted.

PARKINSON'S

SLOT INSTALLATIONS

FOR QUOTATIONS

WRITE—

PARKINSON AND W. & B. COWAN LTD.
(PARKINSON BRANCH)
LONDON AND BIRMINGHAM.

The Barnard Castle District Council and the Gas-Works.—At a crowded meeting of the inhabitants of Barnard Castle held on Thursday, a motion to approve of the application to Parliament by the District Council for power to purchase the undertaking of the Gas Company and supply gas in the district was rejected by 141 votes to 94. The announcement of the numbers was received with great cheering.

Gas Profits at Bakewell.—In the course of a long discussion which took place at a recent meeting of the Bakewell Urban District Council concerning the financial position of the town and the profits made on the gas-works, the Chairman (Mr. B. Morton) claimed that the profits made on the latter had enabled the Council to carry out many public improvements from current income, for which they would otherwise have had to borrow money. Bakewell, he asserted, was in a better financial position to-day than it had ever been before.

Gas Failure at East Dereham.—At the meeting of the East Dereham Urban District Council held last Wednesday, reference was made to the streets having been in darkness on Christmas Eve. The Chairman (Mr. George Brett) said that as several complaints had been made to him that the street-lamps were not lighted except at the corners that night, it was only due to the Gas Manager and to himself, as Chairman of the Gas Committee, to say that every effort was made to light the streets as usual; and it was only decided not to do so when it was seen that the quantity of gas in the holder was so small that it was absolutely necessary, if the whole town was not to be plunged into darkness on a busy night, to conserve what little gas there was. This shortage was due to the fact that an extraordinary amount of gas had been consumed during the dark and foggy days preceding Christmas Day; many of the shops having burnt gas the entire day through. The whole trouble was due to the fact of the present gasholder being insufficient to cope with emergencies. It was decided that the question of providing a new holder should be considered.

The Kitson Lighting in Portland Place.—At the meeting of the Marylebone Borough Council on Thursday, the Lighting Committee reported that they had received a letter from the United Kingdom Lighting Trust, Limited, stating that unless the Council were prepared to increase the present very inadequate terms of payment for lighting Portland Place with Kitson lamps, they would be compelled to remove the lamps on or before a date specified; and they had accepted the notice. As, however, they had some doubt as to whether it was strictly in accordance with the terms of the agreement, they directed the Town Clerk to give the requisite notice to the Company to terminate the agreement. The Borough Surveyor having reported that he had received complaints that on the 3rd inst., at about eight o'clock in the evening, seven of the Kitson lamps in Portland Place were either entirely out of lighting, or merely giving a glimmer, and that he had no alternative but to give instructions for the ordinary gas-lamps in the thoroughfare to be again put in lighting, and to notify this to the Company, the Committee approved of this action of the Borough Surveyor. They also received a letter from the Lighting Trust stating that they had reason to think that the complaints with regard to the lamps had been very much exaggerated; that only one lamp was out on the night in question; and that the others were going well from eight o'clock during the rest of the night. They added that if the Council were putting into lighting the ordinary gas-lamps immediately, they would be glad to know whether they might remove their posts before the expiration of the notice given by them. The necessary permission was granted.

The Eckington and Mosborough Gas Company have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for purifiers on Green's system.

Mr. John A. Harris, the Manager of the Great Wigston Gas Company, was recently elected President of the Wigston and District Free Church Council. He is also a Manager on the Council Schools.

The Manchester Corporation Water Committee have received from their Engineer (Mr. G. H. Hill) an estimate of the probable sum that will be required to pay for the new works which they hope to carry out in the present year, including the Thirlmere pipe-laying. The expenditure is put at £1,294,700.

The Water-Works and Fire Brigade Committee of the Coventry Corporation have decided to apply to the Local Government Board for sanction to a loan of £15,000 to cover the balance of the amount of purchase money of the North Warwickshire Water Company's undertaking, advanced out of revenue, and to provide for extensions.

In a review of the past year's progress in Longton, published in the "Staffordshire Sentinel," the excellent financial position into which the gas undertaking has been brought by the combined efforts of the Gas Committee and the Manager (Mr. W. Langford) is referred to. Since the works were taken over by the Corporation, no less than £53,897 has been applied in relief of the rates. The undertaking is over capitalized; but, at the present rate of repayment, no less than £90,000 of the outstanding loans, now amounting to £132,450, will be wiped out in 25 years.

The Leeds Fire-Clay Company, Limited, notify the following alterations in their staff: Mr. A. Barrett, who has been Secretary for fourteen years, has been elected to the Board, and has been appointed Managing-Director and Deputy-Chairman of the Company. Mr. B. J. W. Lone, who has for many years been one of the Company's Managers in London, has been elected a Director, and appointed to control the Sales Department in London and the South. Mr. H. J. Boot, for several years Mr. Barrett's assistant, is to be Secretary of the Company.

Tunbridge Wells has just had a taste of the inconvenience which may be caused by the untimely failures to which the electric light is so subject. On Saturday evening, a large number of people had assembled at the Technical Institute for the annual distribution of prizes to the students; and just as the Mayor was about to deliver his address, the electric light went out. The Mayor, however, nothing daunted, began his speech; and for some ten minutes the audience were compelled to listen to him in the dark. At the end of that time, a supply of candles was fortunately forthcoming.

Tenders must be delivered at the Branch Bank of England, Newcastle-on-Tyne, not later than Ten o'clock on the morning of Thursday, the 21st day of January next; or at the Bank of England, London (Branch Banks Office), or any other Branch of the Bank, not later than Three o'clock the preceding evening, Wednesday, the 20th inst.

NEWCASTLE AND GATESHEAD WATER COMPANY.

ISSUE (BY TENDER) OF £100,000 ORDINARY STOCK.

Maximum Dividend 7 per cent. per annum.

Minimum Price £140 per cent.

The Directors Give Notice that they are prepared to receive, through their Bankers, the Bank of England, Newcastle-on-Tyne branch, TENDERS for the above Stock.

[Tenders will also be received for transmission to their Newcastle Branch by the **Bank of England, London (Branch Banks Office)**, or by any other Branch of the Bank.]

The Share Capital under the Act of 1898 (£480,000 including premiums) was authorized by resolution of the Shareholders to be raised by Ordinary Stock with a Maximum Dividend of £7 per cent. per annum, of which £269,000 has been issued (including premiums).

The amount now to be raised is required to meet the expenditure on New Reservoir on the River Rede and other Works in progress. The Reservoir will be completed and brought into use during this year, when the Company's storage will be largely increased.

The average Dividend for the ten years, 1894 to 1903, on the 7 per cent. Stock has been at the rate of £5 13s. 4d. per cent. per annum.

The Accounts are made up annually and submitted to the Proprietors in February; and the Dividends are declared half-yearly in February and August.

Jan. 11, 1904.

CONDITIONS OF TENDER.

1.—Applicants may tender for one Lot of £100 of the before-mentioned Stock, or for more Lots than one upon the Form of Tender, and the Form, accompanied by a deposit of £10 per cent. on the nominal amount of Stock applied for, must be filled up and signed by the Applicant, and delivered to the Company's Bankers, the Bank of England, Newcastle-on-Tyne Branch, **not later than Ten o'clock on the morning of Thursday, the 21st day of January** instant, on which day they will be opened. Tenders will also be received by the Bank of England, London (Branch Banks Office), or at any other Branch of the Bank, **not later than 3 o'clock on the preceding evening, Wednesday, the 20th inst. The deposit must not be enclosed in the Tender.**

2.—The Stock will be allotted to the highest tenderers, but no Tender will be considered at a lower price than **£140 for each £100 Stock.** In the event of the receipt of Tenders at or above the minimum price for a larger amount of Stock than that proposed to be issued, any Tenders received at the lowest prices at or above such minimum will be subject to a *pro rata* diminution upon Allotment.

3.—Shortly after the date for receipt of Tenders, notice will be sent to each Applicant whose Tender has been accepted, stating the amount due thereon, which amount must be paid to the Company's Bankers (as above) on or before the 30th day of January, 1904, and if from any cause whatever the same shall not be so paid on that day, the purchaser shall pay interest thereon from the said date until payment at the rate of £6 per cent. per annum, but in the case of the failure of the purchaser to complete his purchase within Three months from the date of Allotment, the deposit will be liable to forfeiture. If paid before the 30th day of January, a discount at the rate of £4 per cent. per annum will be allowed on the amount of such prepayments.

4.—On payment of the purchase money in accordance with these conditions, the Stock purchased will be registered in the Company's books in the name of the purchaser or his nominee, free of expense, and the said Stock will thereupon become transferable in the usual way.

5.—The Registered Holders will be entitled to dividends accruing on the same as from the 1st day of February, 1904, but this shall not include any dividend declared or paid after that date for the period before that date.

6.—The Stock is sold under and subject to the provisions of the Newcastle and Gateshead Water-Works Acts, 1898 (as amended by the Act of 1902), and the various Acts therewith incorporated.

7.—Tenders must be made upon the printed forms, which may be obtained at the Bank of England (Branch Banks Office), or at any of its Branches; or at the Offices of the Company, Pilgrim Street, Newcastle-on-Tyne.

A silver medal was awarded to the Lucas Light at the International Exhibition of Inventions at Brighton last month.

Messrs. Thomas Piggott and Co., Limited, of Spring Hill, Birmingham, have removed their London office to No. 63, Queen Victoria Street, E.C.

The contract entered into by the Marylebone Borough Council with Messrs. Pontifex and Co. for the adoption of the incandescent system of gas lighting throughout the borough will commence on the 1st prox.

Within a period of about a week, no fewer than 117 panes of glass in the street-lamps of Loughborough have been broken. This wilful damage has been going on for months, in spite of warnings posted about the town; but until the end of last month, it proved impossible to catch anyone. On December 26, a "street arab" was seen to smash two panes of glass in a lamp; and a fine of 15s. has been imposed on him, in addition to the payment of 1s. 4d. for the damage done.

The Ashford Urban District Council have accepted the tender of the Chemical Engineering Company and Wilton's Patent Furnace Company for the supply and erection of a sulphate of ammonia plant at their gas-works.

On Monday of last week, the Birmingham Association of Mechanical Engineers paid a visit to the works of the Cannon Iron Foundries, Limited, at Deepfields. Starting with the electric light and power generating station, the members were much interested in the gas-engines which operate dynamos and motors for power purposes on the new side of the works. This plant is said to be one of the most modern ones in Staffordshire, and is driven by gas produced by a Dowson plant adjoining the power-house. Passing from here, the next part to be inspected was the gas-stove foundries, where some hundred moulders were at work on every possible description of castings. At the conclusion of the visit, the members were entertained to refreshment by the Chairman, Mr. Clayton, at Coseley Hall, previous to their departure for Birmingham.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ENGINEER AND MANAGER. Southport Gas Department. Jan. 25.
DRAUGHTSMAN. Edinburgh and Leith Gas Commissioners.
WORKING MANAGER (Small Works). No. 4150.
CHARGE OF METER, STORE, AND FITTING DEPARTMENT. 4148.
APPRENTICES (TWO) GAS ENGINEERING FIRM. No. 4102.

Situation Wanted.

GAS FITTER. No. 4149.
COLLECTOR (Slots). 4151.

Plant, &c., for Sale.

STATION METER. Shepshed Gas-Works.

Sales of Stocks and Shares.

BARKING GAS COMPANY. Jan. 19.
CROYDON GAS COMPANY. Jan. 19.
LOWESTOFT WATER AND GAS COMPANY. Jan. 19.
NEW RIVER COMPANY. Jan. 14.
NEWCASTLE AND GATESHEAD WATER COMPANY. Jan. 21.
SHREWSBURY GASLIGHT COMPANY. Jan. 27.
PORTSMOUTH WATER COMPANY. Jan. 21.
SOUTH ESSEX WATER COMPANY. Feb. 2.

TENDERS FOR

Bricks (Various).

EDINBURGH AND LEITH GAS DEPARTMENT. Tenders by Jan. 25.

Coal.

COPENHAGEN LIGHTING DEPARTMENT. Tenders by Jan. 19.

Fire-Clay Goods.

BIRKENHEAD GAS DEPARTMENT. Tenders by Jan. 14.
BURY GAS DEPARTMENT. Tenders by Jan. 18.
COVENTRY GAS DEPARTMENT. Tenders by Jan. 16.
HEYWOOD GAS DEPARTMENT. Tenders by Jan. 19.
SALFORD GAS DEPARTMENT. Tenders by Jan. 21.
TYLDESLEY-WITH-SHAKERLEY GAS DEPARTMENT. Tenders by Jan. 19.

Retorts.

BIRKENHEAD GAS DEPARTMENT. Tenders by Jan. 14.
BURY GAS DEPARTMENT. Tenders by Jan. 18.
HEYWOOD GAS DEPARTMENT. Tenders by Jan. 19.
SALFORD GAS DEPARTMENT. Tenders by Jan. 21.
TYLDESLEY-WITH-SHAKERLEY GAS DEPARTMENT. Tenders by Jan. 19.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

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MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

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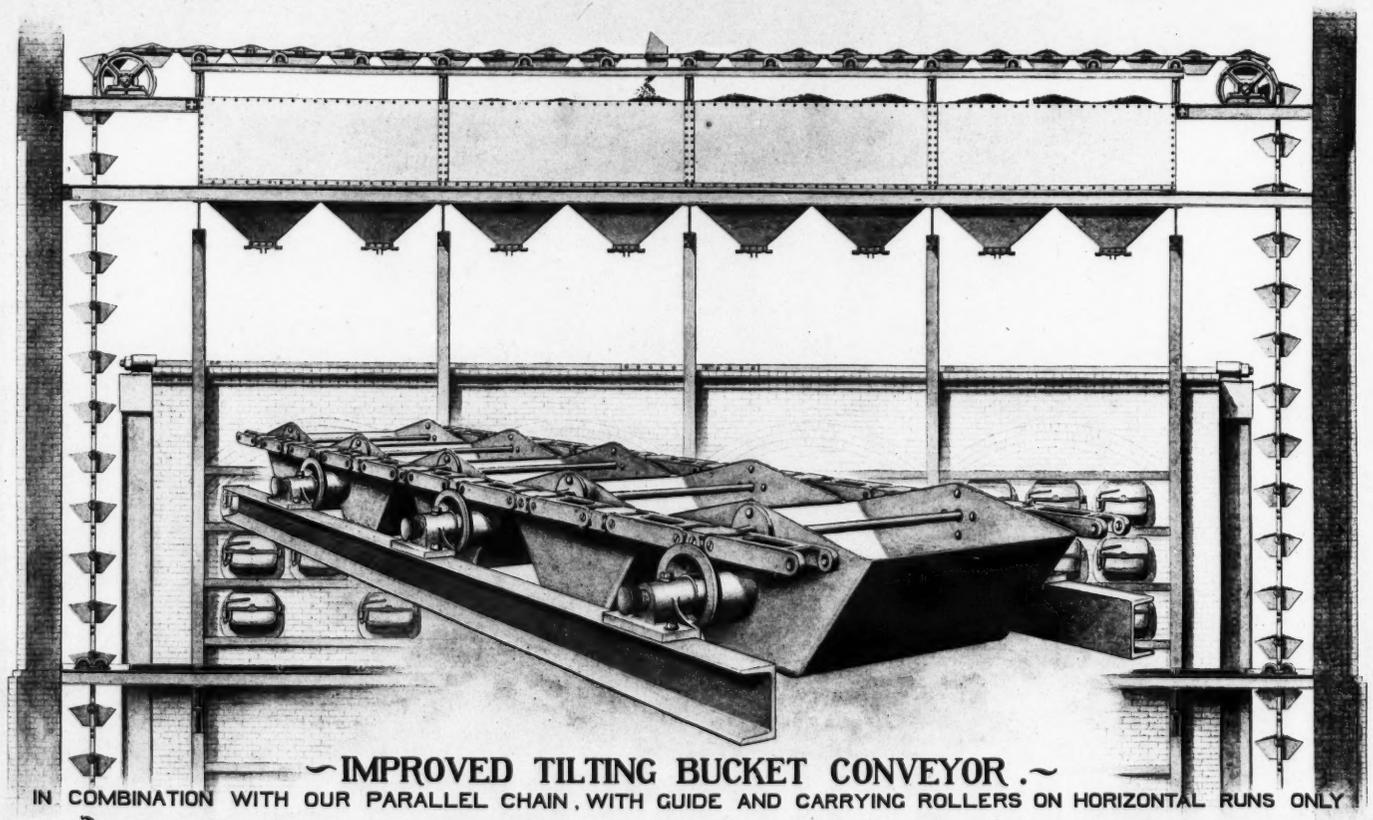

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Printed for Walter King, by King, Sell & Olding, Ltd.; and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Jan. 12th, 1904.

Collotype by Waterlow & Sons Ltd.

A Selection has been made for the post advertised under No. 4140. Applicants please note.

COMPETENT Gas-Fitter seeks re-engagement. Well up in Iron and Compo. Age 33 Years. Good References.
Address No. 4149, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, COLLECTORSHIP.

YOUNG Man requires position in Gas- Works as COLLECTOR—Slot-Meters. Age 18. At present in Works where he has been for past Eighteen Months.
Address No. 4151, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TWO Apprentices wanted by a firm of Contracting Gas Engineers. Must be well Educated.
Apply, giving full Particulars, to No. 4132, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for a Town in South Devon, a WORKING MANAGER for Gas-Works. Present make 1¼ Millions. House, Coal, and Gas free. Must Light and Extinguish Lamps. One who could do Gas-Fitting preferred. Good opportunity for energetic Man.
Apply, by letter, stating Experience, Age, and Wages required, to No. 4150, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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WANTED, a Competent and Ex- perienced DRAUGHTSMAN, accustomed to Structural Steelwork, Roofs, &c., Quantities, and Strains. One with some knowledge of Gas-Works Construction will have preference. Wages £3 3s. per week.
Apply, by letter, stating briefly Training and Experience, and enclosing *copies* only of Testimonials, addressed to Mr. W. R. HERRING, Chief Engineer and Manager, Gas-Works, New Street, EDINBURGH.

WANTED, for a Large Provincial Gas- Works, a competent Man to TAKE CHARGE of the Meter, Stove, and Gas-Fitting Departments.
Applicants must have had good Experience in Repairs of Meters and Stoves, and in pushing the Sale and Hire of Stoves and Fires.
A knowledge of Maintenance of Burners, &c., for Incandescent Lighting will be a recommendation.
Apply by letter (without Testimonials), stating Experience, Salary required, &c., to No. 4148, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF SOUTHPORT.

APPOINTMENT OF GAS ENGINEER AND MANAGER.

THE Gas Committee are prepared to receive APPLICATIONS for the position of GAS ENGINEER and MANAGER of their Works and Undertaking at Southport.
Applicants, who must either have been Managers or Deputy-Managers of large modern and successful Gas Undertakings, must state in their Applications their Age, full detailed Particulars of their Mechanical, Practical, and Scientific Training, and the Salary they are prepared to accept.
The minimum value of the office will not be less than £500 per annum. The Committee are prepared to pay a Salary in accordance with the experience and ability of the person appointed.
Details as to Gas Manager's Residence and further Particulars may be obtained on application to the undersigned.
Canvassing by a candidate, or by anyone on his behalf, will be a disqualification.
Applications, accompanied by *copies* (which will not be returned) of from two to five Testimonials as to the candidate's professional ability must be forwarded to my office, endorsed "Gas Engineer," on or before Monday, the 25th inst.

By order,
J. ERNEST JARRATT,
Town Clerk.

Town Hall, Southport,
Jan. 6, 1904.

TO BE SOLD — Twin-Cylinder Gas- ENGINE, 6 n.h.p., by Crossley; Cylinders 8 in. diameter by 18 in. stroke, and Gas-Bag.
NEW GASHOLDER SHELLS, 40 feet diameter by 12 feet deep, and 50 feet diameter by 15 feet deep, with or without New Steel Tanks and Standard Guides.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FIRE-CLAY GOODS.

THE Gas Committee of the Coventry Corporation invite TENDERS for the supply of FIRE-CLAY GOODS required during the current Year.
Specification and Form of Tender, with Bill of Quantities, may be obtained on Application to the undersigned.
The Gas Committee do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, marked "Tender for Fire-Clay Goods," and addressed to the Chairman of the Gas Committee, Gas-Works, Coventry, must be delivered on or before Saturday, Jan. 16, 1904.

FLETCHER W. STEVENSON,
General Manager and Engineer.

Gas-Works, Coventry,
Jan. 5, 1904.

1500 Feet Cowan Station Meter, with 4-inch Connections and Bye-Pass Valves, in Good Working Order, FOR SALE.
SHEPSHED GAS-WORKS, LEICESTERSHIRE.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of FIRE-BRICKS, RETORTS, &c., for their various Works.
Full Particulars may be obtained on application to Mr. Wm. W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.
Sealed Tenders, endorsed "Tender for Fire-Clay Goods," addressed to the Chairman of the Gas Committee, to be delivered to me not later than Three p.m. on Thursday, the 21st of January, 1904.

L. C. EVANS,
Town Clerk.

Town Hall, Salford,
Jan. 8, 1904.

THE Gas Committee of the Corporation of Heywood are prepared to receive TENDERS for the supply of RETORTS and FIRE-CLAY GOODS.
Specification and Quantities and Form of Tender may be obtained upon application to Mr. W. Whatmough, Gas Manager.
Contractors tendering for this work must pay their workpeople at least the Standard or Trade Union Rate of Wages, and observe the trade conditions which attach to the various kinds of work for which the Tender is sent in.
Tenders, endorsed "Retorts and Fire-Clay Goods," to be sent to me not later than Tuesday, Jan. 19, 1904.

By order,
GEO. G. BOUCHIER,
Town Clerk.

Municipal Buildings, Heywood,
Dec. 16, 1903.

COUNTY BOROUGH OF BURY.

TO RETORT AND FIRE-BRICK MANUFACTURERS.

THE Gas Committee are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, and FIRE-CLAY required at their Gas-Works.
Forms of Tender may be obtained from Mr. H. Simmonds, Engineer and Manager, Gas-Works, Elton, Bury.
Tenders, sealed and endorsed "Tender for Retorts, &c.," to be sent to the undersigned not later than Monday, the 18th of January, 1904.

JOHN HASLAM,
Town Clerk.

Municipal Offices, Bank Street,
Bury, Dec. 30, 1903.

TYLDESLEY-WITH-SHAKERLEY URBAN DISTRICT COUNCIL.

THE Gas Committee of the above Council invite TENDERS for FIRE-CLAY GOODS, including Retorts, Bricks, Blocks, Tiles, Fire-Clay, Four Furnace Doors, Four Clinkering Doors, and Primary and Secondary Air Boxes.
Full Particulars and Quantities with Form of Tender may be obtained on application to Mr. R. H. Ginman, Engineer, Gas-Works, Tyldesley.
Sealed endorsed Tenders, on Official Forms only, to be sent to the undersigned not later than Tuesday, Jan. 19, 1904.

WM. J. MATTHEWS,
Clerk to the Council.

Council Offices, Tyldesley,
Manchester, Jan. 6, 1904.

TENDERS FOR GAS COAL.

THE Lighting Department of Copen- hagen are prepared to receive TENDERS for the supply and delivery of 150,000 Tons of best GAS COAL from the beginning of March until the end of December, 1904.
The Lighting Department reserve the right to divide the Contracts between two or more Contractors.
Further Information and Conditions for the delivery may be obtained on application to Direktören for Kôbenhavns Belysningsvœsen, Vestre-Boulevard 22, Copenhagen B.
The Tenders, sealed and marked "Tilbud paa Kul," to be sent to Direktören for Belys, Ningsvœsnet, Vestre-Boulevard No. 22, Kôbenhavn B, before the 19th of January, 1904, Twelve o'clock, at which time the Tenders will be opened in the presence of the parties tendering who are in attendance.

THE LIGHTING DEPARTMENT OF COPENHAGEN.
Dec. 22, 1903,

TO RETORT AND FIRE-BRICK MANUFACTURERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for RETORTS, BLOCKS, FIRE-BRICKS, FIRE-CLAY, &c., required at the Gas-Works during the current Twelve Months.
Forms of Tender may be obtained from Mr. T. O. Paterson, Gas Engineer, Gas-Works, Thomas Street.
Tenders, sealed and endorsed "Tender for Retorts, &c.," to be sent in to me not later than Five o'clock in the afternoon of Thursday, the 14th of January, 1904.
The person whose Tender may be accepted will be required to enter into a contract containing a clause as to the payment of the rate of wages, and the observance of the hours of labour recognized and agreed upon between the Trades' Unions and the Employers in the locality in which the work for carrying out the Contract is to be performed.
The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
ALFRED GILL,
Town Clerk.

Town Hall, Birkenhead,
Jan. 4, 1904.

ATTERTON'S Patent Charging Machine, especially adapted for Small Works up to 50 Millions. Nearly 40 already supplied, and still supplying. Would soon repay for small outlay. Increased make and reduction in cost.
Apply to E. PADFIELD AND CO., 96 & 98, Leadenhall Street, LONDON, E.C.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

TO BRICK AND TERRA-COTTA MANUFACTURERS.

THE Commissioners are prepared to receive TENDERS for the supply of Ordinary and Special Composition Terra-Cotta, Enamelled, and Glazed BRICKS, delivered in Railway Waggons at their Sidings, Gas-Works, Granton, near Edinburgh (Caledonian or North British Railway Systems), or free on rail alongside Quay, Granton Harbour.
Deliveries to commence about the end of March, 1904, and to continue for a period of about Two Years. There will be about 2 Million Composition Bricks and 300,000 Red Terra-Cotta Facing Bricks, in addition to Arch Bricks, Bull Nose, Splays, &c.
Full Particulars and Schedules of Quantities and Forms of Tender can be obtained upon application to Mr. W. R. Herring, M.Inst.C.E., Chief Engineer and Manager, New Street Works, Edinburgh.
Tenders to be lodged with the undersigned on or before Monday, the 25th day of January, 1904, at Ten a.m., sealed and endorsed "Tender for Composition and Terra-Cotta Bricks, &c."
The Commissioners do not bind themselves to accept the lowest or any Offer, and reserve to themselves the right of accepting the whole or any portion of the materials tendered for, and, further, to nominate more than one party to supply their requirements in the nature of both Composition and Terra-Cotta Facing Bricks.

JAMES M'G. JACK,
Clerk.

25, Waterloo Place, Edinburgh,
Dec. 26, 1903.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
CROYDON COMMERCIAL GAS AND COKE COMPANY.

NEW ISSUE OF £3620 FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 19, 1904, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

BARKING GAS COMPANY.

93 £10 ORDINARY 7 PER CENT. SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Tuesday, Jan. 19, 1904, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

LOWESTOFT WATER AND GAS COMPANY.

SALE BY AUCTION OF 400 ADDITIONAL ORDINARY £10 SHARES,
Ranking for 7 per cent.; the Dividend on similar Shares in the Company having been 5¼ per cent. for several Years past. Also
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, London, E.C., on Tuesday, Jan. 19, 1904, at Two o'clock, in Lots, by order of the Directors.
The Company, incorporated in 1853, supplies Water and Gas in Lowestoft and the surrounding District. The water-rental in 1891 was £7146, in 1902 it exceeded £14,000; and the Gas consumption has advanced from 43 Million cubic feet in 1891 to upwards of 73 Millions in 1902. New works to keep pace with the increasing demand for Water and Gas are necessary; and it is for these works that the New Capital is being raised.
Particulars of Sale, and Form of Instructions for the Auctioneer or Secretary to purchase for Investors unable to attend the Auction, obtainable post free of the SECRETARY of the Company, 137, London Road, LOWESTOFT, and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTH ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK,
AND
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 2, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices.
Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

SHREWSBURY GAS LIGHT COMPANY.

DESIRABLE INVESTMENT.

THE Directors of the above Company invite TENDERS for

£10,000 SHREWSBURY GAS CONVERTED ORDINARY STOCK

Minimum Price of Issue, £110 per £100 Stock.

This Stock is entitled to a Standard Dividend of 5 per cent., payable half yearly; and the Maximum Dividend has been paid for many Years.

January 27, 1904, is the last day for the reception of Tenders.

Forms of Tender may be had on application to LLOYDS BANK, LIMITED, SHREWSBURY, or to the Company's SECRETARY, from whom any further Information can be obtained.

By order of the Directors,
WM. BELTON,
Secretary.

Gas-Works, Shrewsbury,
Dec. 17, 1903.

NEW RIVER COMPANY.

ISSUE OF £100,000 THREE PER CENT. DEBENTURE STOCK "C,"

Authorized by the New River Company's Act of 1893,

AND OF

£200,000 THREE PER CENT. DEBENTURE STOCK "D,"

Authorized by the New River Company's Act of 1897.

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the above ISSUES, bearing Interest at Three per Cent. per Annum and redeemable at par at any time after the expiration of 25 Years from the date of issue upon Six Months' previous Notice being given by the Company.

Particulars, Conditions of Sale, and Forms of Tender may be obtained at the Company's Office, Rosebery Avenue, Clerkenwell, E.C.

Sealed Tenders are to be delivered at the New River Office not later than Ten o'clock a.m., on Thursday, the 14th of January, 1904.

THE RESERVE PRICE HAS BEEN FIXED AT £86 PER CENT.

N.B.—On the transfer, pursuant to the Metropolis Water Act, 1902, of the Water Undertaking of the Company to the Metropolitan Water Board, these Debenture Stocks will, under the provisions of that Act, be secured on the whole Water Fund of the Water Board, and have, in addition, the security on the rates provided by the Act.

The Stocks are a lawful investment for Trustees.

By order of the New River Company,
JAMES SEARLE,
Clerk.

New River Office, Rosebery Avenue,
Clerkenwell, E.C., December, 1903.

Sixth Sale, Water Order, 1902.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

IMPORTANT SALE OF NEW ISSUE OF SHARES
IN THIS OLD-ESTABLISHED AND GOOD DIVIDEND-PAYING COMPANY.

ERNEST SAPP & CO. are favoured with Instructions from the Directors of the above Company to SELL BY PUBLIC AUCTION, at the Lower Albert Hall, Commercial Road, Portsmouth, on Thursday, Jan. 21, 1904, at Seven o'clock in the Evening (in convenient Lots), the sixth portion of the New Issue authorized under "The Borough of Portsmouth Water Order, 1902," consisting of

2000 SHARES OF £5 EACH

(fully paid), forming part of the New Ordinary Capital authorized under such Order.

The Auctioneers desire to call the special attention of Capitalists, Investors, and others to this very favourable opportunity of securing Shares in such a thoroughly sound Local Company.

The Shares will be sold *free of any Charges*, Fees, or Expenses whatever to the Purchaser.

Full Particulars and Conditions of Sale may be obtained, with any further Information, from the Secretary of the Company, J. L. WILKINSON, Esq., F.C.I.S., at the Company's Offices, Commercial Road, PORTSMOUTH; or of the AUCTIONEERS, at their Offices, 15, Commercial Road, PORTSMOUTH.

Telephones { National, 29v. / Municipal, 69.
Telegraphic Address, "Auction, Portsmouth."

Now Ready, Price 15s., Limp Cloth,
AN
ANALYSIS OF THE ACCOUNTS
OF THE
METROPOLITAN WATER COMPANIES
FOR THE YEAR 1902-1903.

Compiled by
WOOD, DREW, & CO.,
Chartered Accountants.

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

GREAT SAVING IN FUEL

"A VERY SIMPLE & INGENIOUS APPARATUS."—VIDE "THE ENGINEER" NOV 12TH 1897

SOLE LICENSEES:
WALLACH BROTHERS.
57 GRACECHURCH ST LONDON E.C

The "Evertrusty" Draught Indicator, also known as **Jensen's Flutometer** (Regd. Trade Mark),

For Retorts, especially for Retorts set on the Regenerative Principle for maintaining the desired pull or draught on the flues.

THE
"ROTARY" STATION METER.

Efficiency Demonstrated.

APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE, MANCHESTER.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to **Mr. EDWARD PRICE,** "Langley," Wyke Avenue, **WORTHING.**

THE
PETROLEUM GAS SYNDICATE
Supply and erect Complete Installations of their
PETROGENE PATENT GAS PLANT
On SALE, HIRE, or ROYALTY.

PETROGENE GAS is the most suitable Illuminant for all Towns, Villages, Factories, Institutions, &c., where a Cheap and Efficient Lighting System is required. It is equally suitable for Heating and Power purposes, and may be used with ordinary Gas Fittings, Stoves, Engines, &c. It may also be used in conjunction with Coal Gas, and affords Gas Companies a ready means of increasing their output without the expense of additional storage.

The Syndicate is prepared to entertain offers of sale of small Gas-Works, whether profit earning or not.

Offices: **28, Victoria St., Westminster.**
Works: **10, Rochester Row, S.W.**

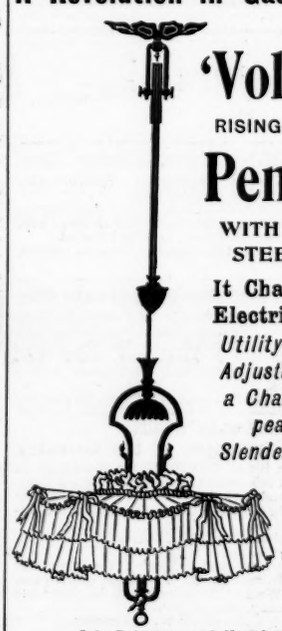
THE PERFECT MANTLE CO^Y.
1c, Aldgate Avenue, London, E.C.

MANUFACTURERS OF THE WELL-KNOWN
SUPERIOR "PERMCO"
MANTLE, IN COTTON AND RAMIE.

Under Welsbach Licence. Can be used legally with any Burner.

Trade Price 26s. 6d. per Gross.
Reduction for Quantities.

A Revolution in Gas-Fittings



IS THE
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RISING & FALLING
Pendant
WITH FLEXIBLE STEEL TUBES.

It Challenges the Electric Light for *Utility, Novelty, & Adjustability, and a Charming Appearance of Slender Elegance.*

Patented in many Countries.

Sole Patentees and Manufacturers:
EDWARD J. SHAW & CO., WALSALL.

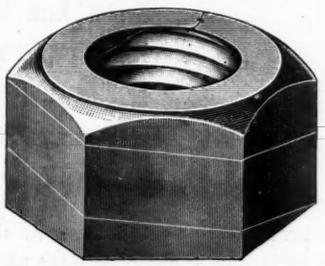
COKE-BREAKERS,

PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
With Elevators and Conveyors worked by Steam or Gas Engine.

GEORGE WALLER & SON,
165, QUEEN VICTORIA STREET, E.C.;
And at STROUD, GLOUCESTERSHIRE.

BAYLISS'S

HAVE ACQUIRED THE PATENT
"HELICOID" LOCK-NUT.



A Coil of Steel Gripping Automatically with Immense Power.

SECURITY. ECONOMY. DURABILITY.
THE MORE THE VIBRATION, THE TIGHTER THE NUT GRIPS.

Made from ⅛ in. to 2 in. Price from 10s. 9d. per gross.

COMPLETE LIST FREE.

BAYLISS, JONES & BAYLISS, LIMITED
ALSO MANUFACTURERS OF
IRON AND WIRE
FENCING,
GATES, &c.
VICTORIA WORKS, WOLVERHAMPTON.
London Offices & Show Rooms, 139 & 141, Cannon Street, E.C.

FIRE

That will satisfy your most fastidious Customer.

BRILLIANT. WARM. NOISELESS.

Send small Sample Order.
Your further Orders will follow.

THE IMPERIAL STOVE CO.,
LEAMINGTON SPA.
Telegrams: "Imperial, Leamington."
Telephone: One X.

GOLD MEDAL FOR FIRES AWARDED 1903.

GOLD MEDAL FOR COOKERS AWARDED 1903.

ALEXANDER CAMERON,
GAS AND CANNEL COAL MERCHANT,
48, WEST REGENT STREET,
GLASGOW.

WELDON MUD

FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
Also Removal of last Traces of
SULPHURETTED HYDROGEN
in catch position.

Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— LIMITED, —
1, FENCHURCH AVENUE, LONDON, E.C.

HEATHCOTE GAS COAL.

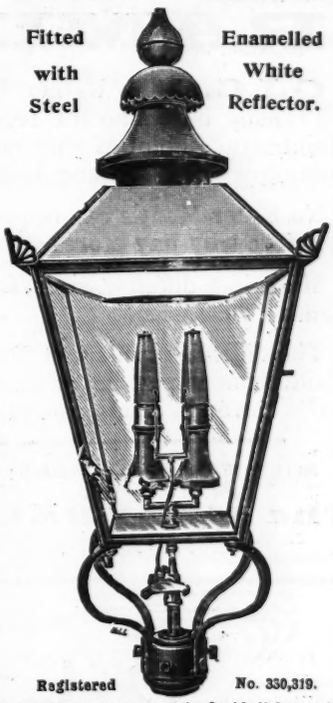
Rich in Illuminating Power and yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

THE
"KILBURN" LANTERN.

Fitted with Steel

Enamelled White Reflector.



Registered No. 330,319.

The "Kilburn" Lantern (for double lights) and the "St. Albans" Lantern have been adopted for lighting the Town of St. Helens.

H. GREENE & SONS, Limited,
Surrey Engineering Works,
Blackfriars Road, LONDON.
Telephone 1693 HOP.
Telegrams: "LUMINOSITY LONDON."

WILSON CARTER & PEARSON, LIMITED,

GAS COAL AND CANNEL FACTORS,
Supply to any Railway Station, or for Export, all kinds of Fuel for Gas and Other Purposes.
ADDRESS CHIEF OFFICES:
Temple Buildings, 50, New Street, Birmingham.

THE EXPORT MANTLE

SUPPLIED TO 180 GAS COMPANIES.
Illuminating Power 80 to 700 Candles.
EXPORT MANTLES, 24/- PER GROSS.
EXPORT REMA SILK MANTLES.
EXPORT HIGH-PRESSURE MANTLES.
Special Quotation for Large Quantities
MANTLES MADE to COMPANY'S own PRESCRIPTION.
Special low Quotations with their own Labels and Stamps.
Burners of all descriptions, solid Brass, from 1/9 per dozen.

NEW EXPORT INCANDESCENT LIGHTING CO., LTD.,
36 MANSELL STREET, LONDON, E.C.
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THE ROYAL "ERA" INCANDESCENT MANTLE SYNDICATE,

Telegrams: "BERYLLINE, LONDON."
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MANUFACTURERS OF THE WELL-KNOWN

'ERA' & 'BRITISH' MANTLES

In Cotton, Ramie, and Double-Woven for "C" and Kern Burners, and in all Sizes; also for Lucas Lamp.

These Mantles are Reliable, Durable, and Brilliant.
SEND FOR PRICE LIST.
Special Prices to Gas Companies and Lighting Authorities.

TROTTER, HAINES, & CORBETT, LIMITED,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

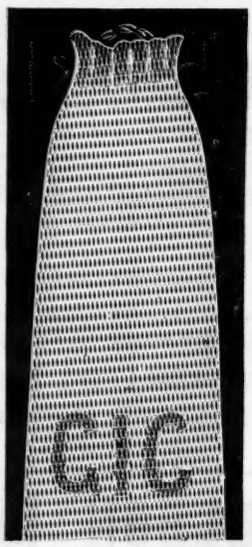
G.I.C.
RAMIE

G.I.C. Pure Ramie Mantles are rapidly becoming the recognized Maintenance Mantles with most Gas Companies and Lighting Authorities.

No better Mantle can be produced; therefore **why pay more**?

Made in 6 different sizes, from the Gem to the Lucas.

The difficult problem of Profitable Maintenance may be at once effectually solved by using this Mantle.



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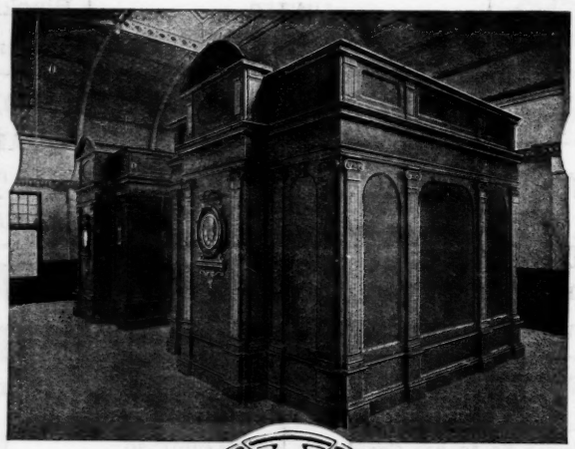
RAMIE

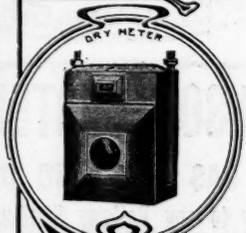
PRICES.	BURNERS.	Per Gross Subject.
G.I.C. Pure Ramie Mantle for "C."	.	27s.
G.I.C. ,, ,, ,,	No. "2" Kern	27s.
G.I.C. ,, ,, ,,	No. "3" ,,	27s.
G.I.C. ,, ,, ,,	No. "4" ,,	30s.
G.I.C. ,, ,, Long ,,	High Pressure	45s.
G.I.C. ,, ,, ,,	Lucas Lamp	7s. per doz.

A trial gross for testing will be sent at these Prices on receipt of order, carriage paid.

SOLE MANUFACTURERS:
The GENERAL INCANDESCENT COMPANY, Ltd.,
Telegrams: "ASABLAZO, LONDON." 56, CITY ROAD, LONDON, E.C. Telephone No. 9536 London Wall.

R. LAIDLAW & SON,
LIMITED
GAS & WATER ENGINEERS,





SIMON SQUARE WORKS, EDINBURGH.

6 LITTLE BUSH LANE, LONDON, E.C.

TWO STATION METERS EACH TO PASS 200000 CUB. FT PER HOUR. ERECTED AT THE GRANTON GAS WORKS FOR THE EDINBURGH & LEITH GAS COMMISSIONERS.

ALLIANCE FOUNDRY & ENGINEERING WORKS, GLASGOW.

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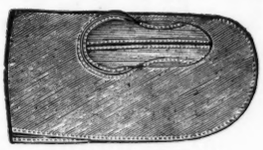

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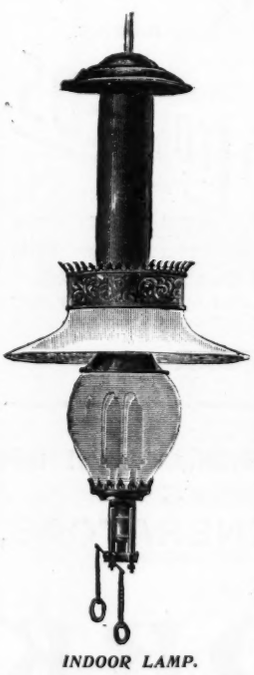

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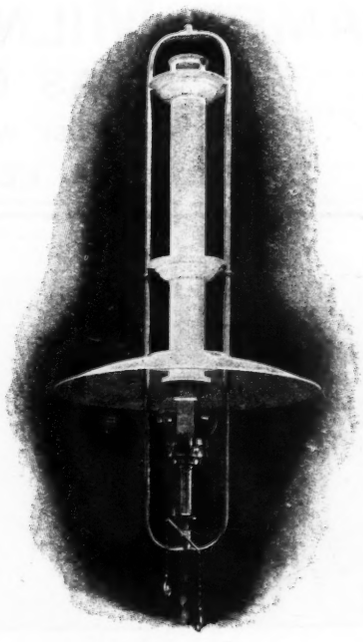

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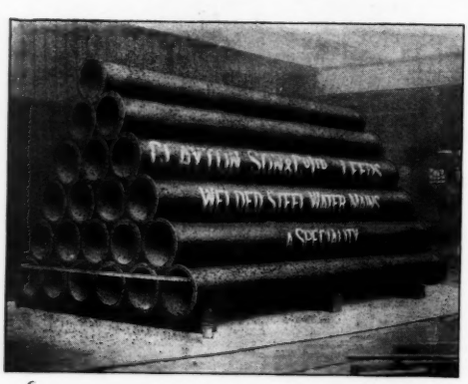

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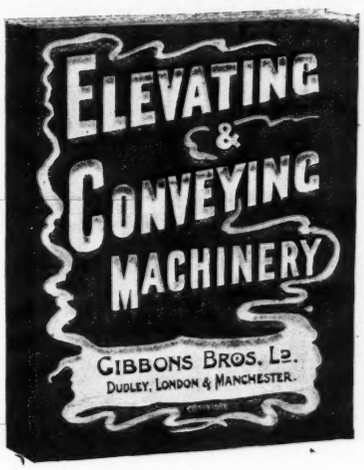

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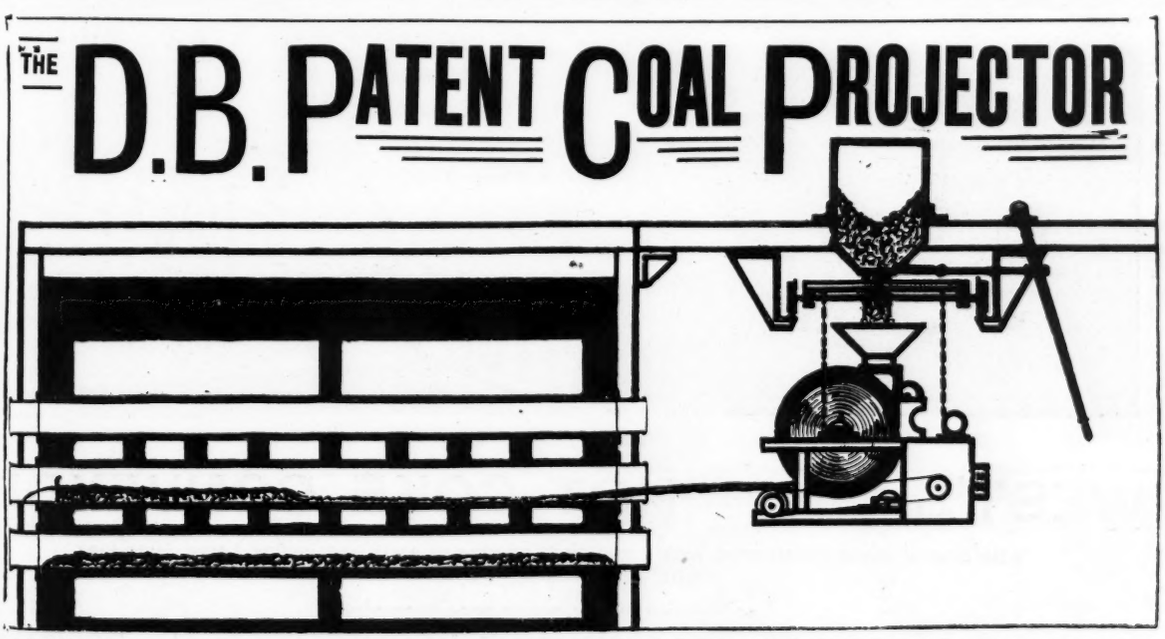

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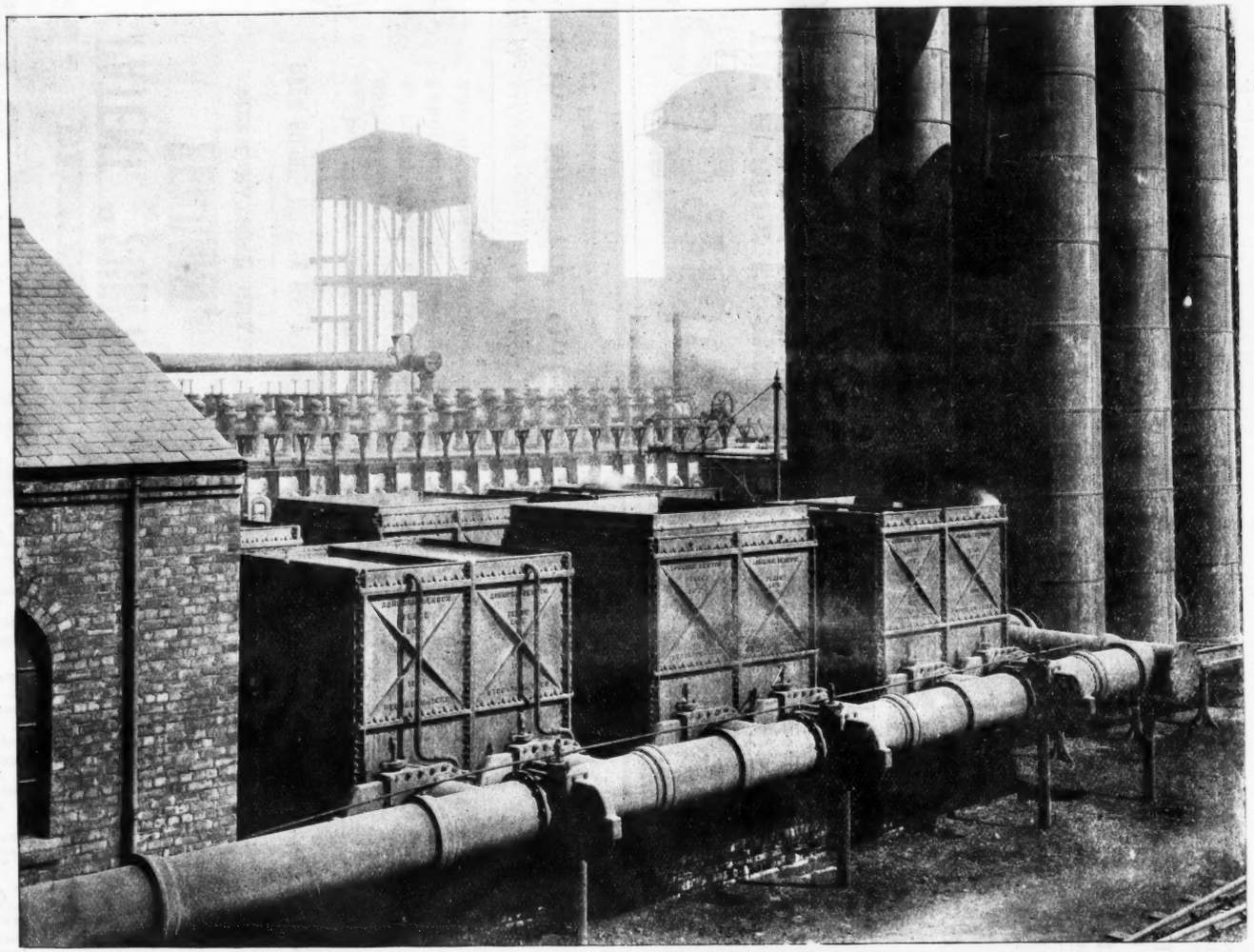

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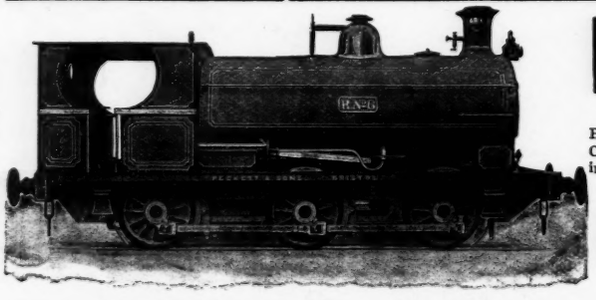

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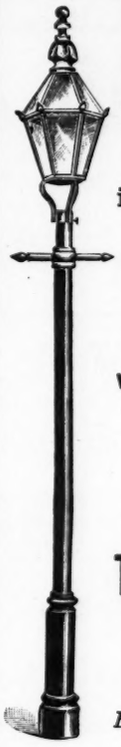

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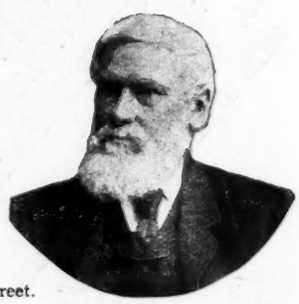
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